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International Livestock Research Institute

medium-term plan 2001 2003

making the Livestock Revolution work for the poor

ILRI medium-term plan 2001-2003
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work for the poor

Contents

Financial Tables
Table 1:   ILRI Research Agenda Requirements by Output, 2001
Table 2:   ILRI Research Agenda–Allocation of Resources, 1999–2003
Table 3:   ILRI Research Agenda, Project and Output Cost Summary, 1999–2003
Table 4:   ILRI Allocation of Project Costs to CGIAR Outputs, 1999–2003
Table 5:   ILRI Research Agenda, 1999–2003: Investments by Sector, Commodity and
            Region
Table 6:   ILRI Research Agenda, 1999–2003: Expenditure by Functional Category and
            Capital Investments
Table 7:   ILRI Agenda Financing and Summary Statement of Activity, 1999–2001
Table 8a: ILRI Allocation of Member Financing to Projects by Output, 1999
Table 8b: ILRI Allocation of Member Financing to Projects by Outputs, 2000
Table 9:   ILRI Research Agenda Staff Composition, 1999–2003
Table 10:   ILRI Cash Requirement, Revenue Flow and Currency Shares, 1999–2001
Table 11:   ILRI Statement of Financial Position, 1999–2003

Annexes

International Livestock Research Institute
Medium-term Plan for 2001–2003

Overview

ILRI's medium-term plan (MTP) for 2001 to 2003 addresses the recommendations of ILRI's first EPMR and follows the directions and priorities set out in the Board approved ILRI strategy to 2010.

Demand for meat and milk will more than double over the next two decades in developing countries. These predicted increases are documented in the report *Livestock to 2020: The next food revolution* by IFPRI, FAO and ILRI. This livestock revolution brings significant research opportunities and challenges, comparable to those that marked the Green Revolution in the 1960s.

The major factors driving the demand are population growth, increased urbanisation and higher incomes. The central challenges for ILRI are to help ensure that resource-poor livestock keepers and consumers reap their share of the benefits and that potential adverse impacts on the environment and on public health are minimised.

ILRI's MTP (2001–2003) is characterised by the following:

- Demand led by the needs and opportunities posed by the Livestock Revolution and a specific focus on ensuring that it serves the poor
- Establishment of priorities by region, system, species and research area based on analysis of external influences, consultations with key stakeholders, potential for impact and relevance to CGIAR priorities
- Systematic and quantitative process of assessing priorities, which takes account of alternative research providers, ILRI's current or potential comparative advantage, and opportunities for partnerships and alliances
- Emphasis on bringing new science to bear on the constraints limiting productivity and sustainability of livestock-based systems
- Development of synergies among ILRI programmes and with partners from public and private sectors
- Increased emphasis on quantifying the role of livestock in improving natural resource management, policy research to provide an enabling environment, valuation, characterisation and use of indigenous plant and livestock biodiversity and strengthening livestock research capacity of partners in developing countries.

ILRI's strategic choices

ILRI's primary beneficiaries are resource-poor livestock keepers in mixed crop–livestock systems with secondary emphasis on those in peri-urban and grassland systems and on the rural and urban poor who consume livestock products. ILRI's major focus will be on increased productivity in the mixed crop–livestock systems in sub-Saharan Africa and Asia—primarily in the subhumid and semi-arid tropics and in the tropical highlands (Figure 1). Limited emphasis will be given to grassland and industrial livestock systems, and to Latin America and the Caribbean and to West and Central Asia and North Africa. ILRI will continue to focus on sub-Saharan Africa because, based on current figures and trends, the share of the population living in absolute poverty is already high and will continue to increase through 2010 in this region.

ILRI will continue to expend more than two-thirds of its resources in sub-Saharan Africa and is making a directed effort to expand the global relevance of the programme. By 2003, more than 70% of the programme in sub-Saharan Africa will have global relevance.
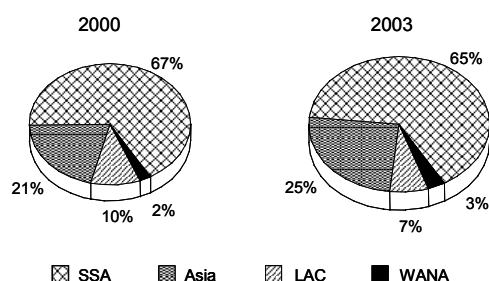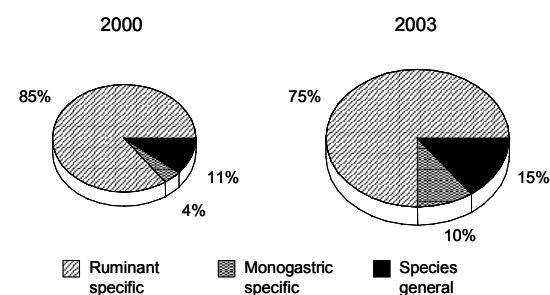
Figure 1. *Regional relevance of ILRI's research.*

ILRI's primary emphasis will remain on ruminants, but with increased attention to swine and poultry, primarily through research in epidemiology, systems analysis and policy. Current estimates based on the extensive strategic planning process indicate that of the 90% share directed to ruminants, half will support biological, systems and policy research relevant to both large (cattle and buffalo) and small (sheep and goats) ruminants; the other half will go to species-specific research on large ruminants (30%) and small ruminants (15%). Over the medium term 15% of the research targeted to ruminants has generic relevance for monogastrics, including the more fundamental research in genomics and immunology as well as the systems and

policy research (Figure 2).

Figure 2. *Relevance of ILRI research to ruminants, monogastrics and species general.*

ILRI will position itself in the discovery-to-delivery-to-impact continuum, working in international consortia and strategic alliances, to ensure complementarity and measurable and sustainable impacts. Greater emphasis is given to alleviating constraints to adoption of livestock technologies, in collaboration with NARES, NGOs and the private sector.

Priority setting

Five necessary conditions are used in setting ILRI's priority agenda: researchability, relevance to poverty reduction, current or potential comparative advantage for ILRI over alternative suppliers, a clear role for ILRI to play, and outputs that will be international public goods.

An objective, priority assessment framework will guide resource allocation among activities. This framework is based on an *ex ante* assessment of probable economic surplus from different research investments, taking account of contribution to poverty reduction; expected economic impact; expected environmental impact; internationality of recommendation domain; and the value of contributions through strengthening capacity, providing research tools and improving research efficiency.

The priority assessments will be adjusted over time in the light of new opportunities, information and knowledge.

Resource allocation

Results from the priority assessment framework will be a principal input to decisions on resource allocation (Figures 1.1, 1.2 and Annex II). However, there will not be a one-to-one correlation between the priority index score and resource allocations because:

- Resource requirements for different types of research. The resources requirements to ensure critical mass and comparative advantage vary for different types of priority research. ILRI's broad portfolio ranges from genomics to participatory research.
- Role and responsibilities. ILRI contributions to different priority research vary from primary to catalytic to facilitative depending on research needs and the contributions of partners. ILRI's appropriate role and resource requirements will generally change over

the course of long-term discovery-to-delivery research.

- Opportunities for leveraging ILRI's resources. Allocation decisions will favour opportunities to accomplish more by leveraging ILRI's resources through outsourcing and attracting matching resources from partners.

Monitoring and evaluation

As part of the annual planning process, ILRI will reassess its priorities in relation to the potential for impact in target regions, the availability of partners, and the cost-effectiveness of activities at alternative locations. Partnerships and modes of operation will be increasingly influenced by the strategies and goals of national and subregional organisations at locations where ILRI works.

Indicative list of CCERs scheduled from 2000–2003

2000
- Vaccines for theileriosis and trypanosomosis

2001
- Livestock feeds and nutrition programme
- Programmatic and cost effectiveness at principal sites in Ethiopia and Kenya

2002
- Livestock genetics and genomics programme
- Market-oriented smallholder systems in West Africa

2003
- People, livestock and environment programme
- Livestock policy analysis programme

Monitoring and evaluation will be strengthened through use of measurable indicators and impact assessment in scientific, socio-economic and environmental terms. Progress will be measured against milestones set in the institute's Medium-term and Annual Research Plans. In addition, ILRI will use Centre Commissioned External Reviews (CCERs) to evaluate relevance and quality of science, potential for impact on livestock development, progress towards milestones and cost effectiveness. These CCERs will be used by management and Board to provide an analytical basis for ILRI's next EPMR in 2004.

Core capacities

ILRI will have core competency in seven areas:

- Systems analysis and impact assessment
- Livestock feeds and nutrition
- Livestock health
- Livestock genetics and genomics
- People, livestock and the environment
- Livestock policy analysis
- Strengthening partnerships for livestock research.

Research undertaken by ILRI through these areas of core competency is described under seven projects plus the System-wide Livestock Programme (Annex 1). These descriptive projects incorporate the activities of ILRI's programmes and operational projects, which often contribute to more than one of the seven descriptive projects.

Outputs from the medium-term project portfolio will include:

- Indigenous livestock and forage genetic resources characterised for disease resistance and other adaptive traits
- Technologies and methodologies to improve livestock productivity and reduce effects of disease and undernutrition
- Improved understanding of constraints and opportunities in evolving livestock systems leading to better targeted interventions
- Improved research methodologies and management practices for sustainable use of natural resources that support agricultural systems involving livestock
- Policy options that encourage innovation and sustainable livestock development

3

- Strengthened national capacity for livestock research and development.

Production-to-consumption systems projects: An integrative mechanism

The production-to-consumption systems approach permeates all ILRI's priority programmes providing a holistic integrating mechanism for accomplishing more with resources available and ensuring relevance. Research to improve livestock productivity and sustainability in market-oriented smallholder systems will help ensure affordable balanced diets for the urban poor while reducing poverty and building assets for the rural poor.

Over the medium term, ILRI will focus on four market-oriented production-to-consumption systems. At the ecoregional level, ILRI scientists will provide the livestock component in consortia of national, regional and international research organisations. ILRI's field-based interdisciplinary teams will draw in their colleagues from the seven priority programme areas and the SLP. These time-bound production-to-consumption systems projects will feed back to ILRI's research prioritisation and impact assessment as well as integrate and field validate research results. Transregional analyses will provide lessons of broad relevance and identify opportunities for transregional technology transfer. ILRI's teams and contributions—disciplinary and otherwise—will vary among regions and systems depending on needs, comparative advantages, partners and alternative suppliers.

The four priority market-oriented production-to-consumption systems for 2001–2003 are:

Smallholder dairy (SSA, Asia and LAC): The doubling in consumption of dairy products in developing countries over the next 20 years provides smallholders with an excellent opportunity for converting low cost feeds and family labour to a high value product. The urban poor may benefit from an affordable dietary supplement providing the essential nutrients required for physical and mental health. Working in partnership, ILRI's market-oriented smallholder dairy research in East Africa has already improved dairy productivity, natural resource management, marketing and policies. This research is expanding through partnerships into West Africa (through EPTHA and CORAF), South Asia (with ICAR, NDDB and ICRISAT), and in Latin America (through CIAT-led TROPILECHE). ILRI's experience with this project has guided the planning and design of the market-oriented systems projects on which ILRI will focus over the medium-term. Among these lessons are the essential needs to identify market opportunities for smallholders, reduce production/marketing costs and risk, integrate production and natural resource management interventions to ensure sustainability and provide an enabling policy environment for smallholders.

Stratified smallholder production-to-market systems (West Africa): Economic reforms and reduced dumping of livestock products from developed regions have increased the market opportunities for meat and milk produced across the ecological–economic transect in West Africa. The principal breeding herds and flocks are located in the drier areas; feed from forages and crop residues are in the intermediate subhumid savannah zone; and the rapidly growing markets for meat and milk are in the coastal areas. With reduction in the trypanosomosis and tick-borne challenge in the subhumid zone, young stock can be moved to the feed production and intensification opportunities in the subhumid zone, reducing grazing pressure on the dry rangelands where the breeding herds remain. ILRI's research targets technologies for sustainable intensification, along with policy and institutional options to improve technology uptake and market access by smallholder livestock producers. ILRI's interdisciplinary contributions, with partners from other centres and national institutes, are linked through the EPTHA, IVC and DMP ecoregional programmes.

Crop–livestock systems in mountainous regions: This project links crop–livestock systems research in the Andes, Hindu-Kush Himalayas, Central Asia and African highlands in collaboration with CIP, ICIMOD, ICRAF and their national partners. Documentation supporting Agenda 21 indicates that whereas only 10% of the world's population live in mountainous regions, their resource management practices affect another 50%. In these mountainous regions, livestock are one of the few market entry points for the resource poor. Income from livestock reduces need for erosive subsistence farming. ILRI's interdisciplinary contributions through research consortia address biophysical, agro-ecological and socio-economic interventions and their impacts.

Rainfed crop–livestock systems in South-East Asia: Among the regions served by the CGIAR, demand growth for livestock product is greatest in SE Asia. This growth provides significant income generating and asset building opportunities for resource poor farmers. Large scale industrialised production competes with smallholders, but also provides opportunities for producing young stock marketed through industrialised systems. Economic and policy analysis will identify means by which the resource poor smallholder can benefit from the market opportunities. As livestock production intensifies, research is especially needed on diseases of intensification and trade, zoonoses and environmental impacts. The ILRI interdisciplinary team based at IRRI is working with national partners to evaluate constraints limiting smallholder livestock development with expectation of opportunity for transregional technology transfer.

Outputs

This research will result in resource-poor livestock keepers having access to better technology and land-use options. This will help to reduce poverty, increase food security and conserve natural resources through use of sustainable agricultural practices. Outputs include:

- Technological options for genetic improvement, feeding systems, disease control and natural resource management.
- Decision support systems for livestock management and productive use of natural resources.
- Policy options for more efficient resource use, particularly through improved input and output markets.
- Integrated crop–livestock land-use options for various levels of intensification.
- Transregional analyses of the impact of technologies and interventions on productivity and sustainability of crop–livestock systems.
- National capacities for livestock research strengthened through collaborative projects, training and information services.

These outputs will be used by NARES, NGOs, policy and decision makers, development agencies, farmers associations and smallholder livestock keepers.

Strategy for the CGIAR in sub-Saharan Africa

The CGIAR's Third Systems Review recommended the development of a strategy with increased emphasis on sub-Saharan Africa and improved collaboration among partners to address issues of poverty reduction, food security and environmental protection. ILRI has played a leading role in the development of this *Strategy for the CGIAR in sub-Saharan Africa* within the broader vision and strategy for agricultural research and development in sub-Saharan Africa developed by FARA and SPAAR. Four priority areas for the CGIAR contribution have been agreed:

- Germplasm and natural resource management technologies
- Technology dissemination
- Policy research
- Capacity building.

For the medium-term, the initiatives and activities in which ILRI will most directly

promote the strategy for the CGIAR in sub-Saharan Africa include:

- Providing the livestock research component on feeds, health, genetics and natural resource management with national partners and through the DMP and the African Highlands and EPTHA ecoregional initiatives, and contributing to policy research with IFPRI.
- Contribute to smallholder dairy research with partners in Ethiopia, Ghana, Kenya, South Africa, Tanzania and Uganda.
- Strengthening capacity for livestock research through training and information services for African NARS.
- Providing degree-oriented research opportunities for national scientists in biotechnology, breeding, GIS, bioinformatics, systems analysis and policy research.
- Supporting ASARECA, SACCAR and WECARD/CORAF Animal Agriculture Research Networks for which ILRI provides co-ordinators.

Summary of 1999 results and 2000 developments

Research in the MTP 1998–2000 period has produced significant scientific advances, which will lead to impact on poverty reduction and natural resource management at the smallholder farm level. Some of the achievements realised in 1999 include:

- *Livestock to 2020: The next food revolution*. ILRI participated in a study with IFPRI and FAO which projects a more than doubling of consumption and production of milk and meat to 2020 and the consequences to feed grain use, food grain price, trade, human nutrition, environmental impact, *inter alia*. This report has direct relevance to priorities for livestock research, development assistance and investment decisions.
- *Conserving African livestock biodiversity*. A comprehensive survey of the state of African cattle genetic resources revealed that at least 21

breeds/strains have become extinct in the last century and, out of the remaining 144 breeds, about 45 are currently at risk of extinction. Three main genetic groups of African cattle were identified: the taurine cattle of West Africa, the sanga cattle of southern Africa and the zebu of eastern Africa. Breed characterisation will support improved selection of appropriate and adapted breeds by African smallholders.

- *Breeding cattle for trypanotolerance*. A region of homology between a major trypanotolerant QTL in cattle and mice has been identified. Advances in research have narrowed the identified QTL region sufficiently for use in marker-assisted introgression of the trypanotolerant QTL into more genetically productive but susceptible cattle breeds and ultimately to positional cloning and identification of the disease resistance gene(s).
- *Immune responses to trypanosomosis*. Results suggest that the development of specific T-cell responses and antibody isotype switching are important factors in disease resistance. Bovine specific reagents and *in vitro* assays were developed to dissect the contribution of accessory cells and interleukins (T helper type 2 responses) to B-cell activation and maturation of the antibody response. Parasite-specific memory T- and B-cell responses were detected in susceptible cattle that were immunised with congopain, a recombinant cysteine protease.
- *Producing immunity to East Coast fever*. Protective immune responses to *Theileria parva* are mediated by schizont stage specific cytotoxic T lymphocytes (CTL). Vaccines based on schizont-specific parasite molecules will have to be delivered through the immune pathway that leads to induction of CTL responses. Three different recombinant *Listeria*, two expressing *T. parva* genes and the third expressing a *Cowdria ruminantium* gene have been developed for delivery. This is an

6

important step in the development of model systems for inducing parasite-specific CTL in cattle and for testing putative vaccine antigens.

- *Recombinant East Coast fever vaccine field tested*. Immunisation with the p67 based vaccine against *T. parva* under natural tick/parasite challenge in field conditions provided 61% improvement in survival compared to non-immunised controls, opening opportunities for development of vaccines based on the p67 molecule.

- *Leading genomics research institute engaged in African problems*. The Institute for Genomics Research (TIGR) in Maryland, USA, is collaborating with ILRI to sequence the *T. parva* genome for the full set of parasite gene products from which to identify vaccine candidates. This approach will complement the identification of schizont antigens for incorporation in a multi-component vaccine.

- *Isolating rumen microbes to better utilise tropical feeds*. Rumen microflora allow adapted livestock to utilise fibrous and tannin rich forages. Twenty-six tannin tolerant rumen bacteria were isolated from cattle, sheep, goats and wild ungulates. Re-introduction of these bacteria to the rumens of non-adapted livestock provides opportunities for them to better utilise the high tannin and fibrous feeds common in the diets of tropical ruminants.

- Ex post *impact assessment establishes the value of investing in livestock research. Ex post* impact assessment of collaborative research in forage technologies and smallholder dairying demonstrated that investment in livestock research produced high rates of return with significant impacts on poverty reduction, through increased household incomes, with neutral or positive impacts on the environment.

- *New models developed for predicting environmental impact. Ex ante* bio-economic and environmental impact assessments show the potential for crop, livestock and natural resource management interventions to increase the aggregated income to communities at the watershed level in the East African highlands by 10 times and reduce soil erosion by 20% in 12 years.

- *Significant productivity increases as a direct result of using forages.* Overall milk sales increased by 21% and calf weights by 30% when calves were fed *Stylosanthes guianensis* in on-farm trials in the forest margins in LAC. Intercropping *Desmodium intortum* with Napier grass produced sufficient feed for a dairy cow and heifer for 100 days and doubled protein in the livestock diet on smallholder farms in East Africa.

- *A practical tool for determining priorities for future research*. A priority assessment framework has been developed based on *ex ante* assessment of probable economic surplus from adoption of the products of research. This framework derives the potential impact on poverty reduction by linking regional poverty data to the prevailing livestock production systems. This makes it a useful quantitative tool to determining the level of research investments appropriate to different research options.

- *Using the Internet for building NARS research capacity*. All ILRI training materials are now freely available on the ILRI website. ILRI has also published jointly with FAO a CD-ROM entitled *Farmers, their animals and the environment,* which provides NARS and universities with comprehensive bibliographies, full-text documents, photographs and videos for use in research and training.

The year 2000 will provide for the transition to the programmatic priorities, implementation strategy and organisational structure for the medium term 2001–2003, following the recommendations of ILRI's first EPMR and the major strategic planning process completed in 1999. The 20-project

structure presented in the 1998–2000 Medium-term Plan will be reduced to seven new problem-oriented multidisciplinary projects (Annex 1). These seven projects will incorporate the successful high-impact-potential activities currently underway, with new activities to address the priorities identified in ILRI's strategic plan.

The CCER scheduled in early 2000 for ILRI's vaccine research will specifically address whether ILRI should continue research to develop vaccines against *T. parva* and trypanosomosis. The possibility and means for commercial delivery as well as technical feasibility of vaccine research will be addressed.

Highlights of changes for 2001

ILRI will meet its contractual commitments for ongoing projects and develop new activities or change ongoing research in line with the Board approved strategy and recommendations from the EPMR and CCERs. The changes initiated in 2000 will be consolidated in the years 2001 and 2002 as resources are reallocated to priority activities. This will involve:

- More emphasis on assessing the impact of livestock on the environment and the economic and environmental trade-offs of alternative interventions
- New work on area wide integration of intensified industrial livestock systems, including monogastrics, to balance their demands for inputs, and absorption of outputs, with local capacity to provide them
- Establishing minimum data sets to model livestock systems and inform *ex ante* impact assessments for targeting livestock research to farmer's needs
- Participatory research on institutional and policy options for improving livestock technology adoption and improved smallholder access to markets in West Africa and Asia
- Establishing bio-informatics capacity to exploit DNA sequence data for the *T.*

parva and *T. brucei* genome sequencing projects for candidate vaccine antigens and development of *in vitro* assays for screening these genes
- Developing antigen delivery systems for induction of cell-mediated protective immune responses to *T. parva*
- Contributing to assessments of genetic diversity in indigenous populations of poultry, buffalo, pigs and yak
- Developing breeding strategies for promoting trypanotolerance and integrated helminthosis control strategies based on genetic resistance in sheep and goats
- Developing decision support tools for conservation and utilisation of livestock genetic resources
- Studying the effects of undernutrition and feed use efficiency in indigenous and crossbred dairy cattle.
- Work with partners to understand pathways for information and technologies to flow from researchers to extension staff and to farmers.

Field-based multidisciplinary teams and task forces will identify constraints, implement and manage agreed research and related activities, package interventions from ILRI and other research providers, evaluate interventions under field conditions and identify and improve delivery mechanisms. Research and related activities will be done mostly through alliances with partners from both the public and the private sectors. ILRI will participate actively in the CGIAR ecoregional and system-wide programmes that have significant livestock components.

Major features of the 2002–2003 project portfolio

Further consolidation and redirection of activities will occur in 2002–2003 as current commitments are completed and new activities start within the framework of the Board approved strategy. The 2002–2003 project portfolio is described in more detail in Annex 1. Major features include:

- Transregional analysis of smallholder dairy systems in sub-Saharan Africa, LAC and Asia to provide essential information on systems evolution and inform technology development and delivery
- Developing tools for genetic enhancement of feed quality of forages and crops and strategies to improve the efficiency of utilisation of tropical feeds
- Improved control technologies and strategies to enhance the delivery and adoption of control methods for ticks and tsetse-borne diseases in collaboration with public and private organisations
- Field validated decision support models to assess effectiveness of livestock disease control strategies at farm, community and national levels
- Characterising indigenous populations of cattle, sheep and goats in Africa and Asia and contributing to characterisation of indigenous swine, poultry, camel, buffalo and yak populations in Asia
- Evaluating and using genetic markers and candidate genes for trypanotolerance and genetic markers for helminthosis resistance in development of breed improvement strategies
- Policy options and strategies to enhance technology adoption and delivery pathways, promote smallholder participation in input and output markets and reduce negative environmental effects of livestock production
- Field validated decision support tools, management strategies and policy options to improve land-use and nutrient management in crop–livestock systems
- Participatory evaluation and identification of best-bet technologies and enabling policies for stratified livestock systems in West Africa
- Improved delivery of information, including Internet-based information systems for national partners
- Training and information activities for livestock research capacity building in

collaboration with the consolidated capacity building programme for sub-Saharan Africa.

Changes in milestones

Project milestones and logical frameworks for the new set of projects are detailed in Annex 1.

Collaboration highlights

In view of the enormity of the challenges facing international livestock research, ILRI will use its position of international leadership to advance the international agenda for livestock research and promote support for partners and alternative research providers. ILRI will continue to play catalytic, facilitative and brokering roles with the emphasis on ensuring that the work is done most cost-effectively through partnerships and alliances (Annex 3). This increased emphasis on partnerships will raise IPR issues that will have to be addressed within ILRI, and with our partners.

ILRI continues to expand collaboration through system-wide and ecoregional programmes led by other centres and provide the leadership for the System-wide Livestock Programme. ILRI continues to work through consortia in Central Asia and LAC. Collaboration in research on livestock, particularly asset accumulation and human well being, has increased with the Global Livestock CRSP.

Involvement in system-wide and ecoregional activities

- Desert Margins Programme led by ICRISAT
- Ecoregional Programme for the Humid and Subhumid Tropics of SSA led by IITA
- African Highlands Initiative led by ICRAF
- Tropileche consortium in Central and South America led by CIAT
- CONDESAN in the Andes led by CIP
- Subregional consortia in the WANA region led by ICARDA

- IARC/NARS Training Group in SSA
- System-wide Livestock Programme
- System-wide Genetic Resources Programme (forages and livestock)
- System-wide Participatory Research and Gender Analysis Programme
- System-wide Property Rights and Collective Action Programme

Centre staffing highlights

By January 2001 the new programme management structure will be in place. As recommended by the EPMR, the Deputy Director General—Programmes will provide leadership for programme management.

In 2000 personnel costs account for 49% of ILRI's budget comprising 69% for internationally recruited and 31% for nationally recruited staff. Responding to the increase in short-term project restricted funding, ILRI will reduce the number of internationally recruited core positions to those essential for scientific and institutional leadership and management. Other internationally recruited positions on life of funding appointments will be staffed by joint appointments, post-doctoral and associate professionals, and seconded and visiting scientists. Sixty-five internationally recruited core positions will be needed for the level of activity envisaged over the medium-term, supported by additional non-core international and senior national positions.

Joint appointments of out-posted scientists with CIAT, CIP, IFPRI and IITA strengthen collaborative activities with these centres.

Project cost components

Restricted funding to support priority activities continues to increase. By 2003, ILRI will allocate 53% of its resources to address health, genetics and feeds, the three major constraints to increasing livestock productivity in developing countries. Research in these areas takes advantage of new opportunities from new science and technologies, especially biotechnology, which although offering the potential for

rapid progress incurs higher costs to ILRI than field-based research. A further 17% will be allocated for policy research and capacity development in NARS to support development of an enabling environment to make full use of the technologies, methodologies and information generated from this research. As ILRI leverages research capacity through partnerships, alliances and outsourcing, it is envisaged that the percentage of funding, but not the absolute amount, for primary work in livestock health and genetics will decrease slightly by 2003. This will free up resources to increase support for:

- Additional studies on *ex post* and *ex ante* impact assessment of interventions using ILRI technologies in benchmark sites to better target development of ILRI technologies under project 1 (Systems analysis and impact assessment)
- Research on the cause of and solutions to the major constraint of undernutrition in tropical livestock under project 2 (Livestock feeds and nutrition)
- New activities on the role of livestock in sustainable management of natural resources and development of project 5 (People, livestock and the environment)
- New research with NARS, NGOs and the private sector on delivery pathways to raise the probability of adoption and impact from technologies and interventions under project 1 (Systems analysis and impact assessment) and project 3 (Livestock health).

ILRI implements work of global relevance and allocates about 60% of its resources to work with potential for transregional impact. ILRI has a special focus on sub-Saharan Africa in view of the special needs of livestock development in this region.

Centre financial health indicators

Despite the uncertain funding environment, ILRI maintains a practice of balancing its annual expenditure with revenue. Over the

medium-term ILRI anticipates a modest increase in total funding. For 2003, US$ 32.6 million total revenues are projected, comprising US$ 13 million from unrestricted funding and centre income and about US$ 20 million from targeted funding, of which two-thirds will be special project restricted.

ILRI will draw on reserves to bridge gaps in project funding to ensure continuity of long-term research. The current operating reserve stands at US$ 5.4 million and capital reserve at US$ 5.9 million. The current ratio (current assets divided by current liabilities) is a healthy 2:1. The long-term stability ratio (operating plus capital reserves divided by revenue and multiplied by 365) is 148 days. This compares favourably with the CGIAR target of 90–120 days.

Financing plan

TAC recommends increased investment in ILRI to 9.3% of the total CGIAR funding, an increase from the current 7.9%. ILRI's funding target is US$ 37 million for 2005, comprising 35% unrestricted funding, 25% programme restricted and 40% project restricted.

Unrestricted finances are particularly valuable to ILRI, providing the flexibility to be innovative and to ensure successful completion of longer-term priority research. The priorities which guide the allocation of unrestricted funds are:

- Initiating new and innovative priority activities
- Filling gaps and shortfalls in ongoing activities
- Leveraging funds from partners and donors giving restricted funds
- Supporting essential programmatic and institutional management.

Unrestricted funds will not support the continuing operational costs of projects that do not attract significant donor support. Once research initiatives are established, project leaders must secure targeted funding to meet operational costs. Generally, a consortium of investors will support the priority research of ILRI and partners.

ILRI will intensify efforts to expand and diversify its investor base to ensure:

- Adequate funding to implement the priority research agenda
- Continuity of funding to complete priority research once started
- Dependable funding—in both long-term investments and consistency in continued funding
- Flexible funding—to initiate new research and pursue innovative and emerging opportunities to bring the best science to the needs of the poor
- Greater diversity in funding—to broaden the base of the CGIAR investors and expand support from the private sector (foundations, philanthropists and for-profit organisations) and from public sector agencies supporting human health and environmental research.

Financial Tables

Table 1. ILRI—Research Agenda Requirements, by Output, [1/] 2001

(expenditure in US$ million)

Centre projects	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS	Project totals
Project 1 Systems analysis and impact assessment			3.2		0.2	**3.4**
Project 2 Livestock feeds and nutrition	0.9	0.7	1.8		0.1	**3.5**
Project 3 Livestock health						
Biotechnologies for disease control			5.1		0.3	**5.4**
Integrated disease control			3.2	0.4	0.1	**3.7**
Project 4 Livestock genetics and genomics	1.5	1.3	0.7		0.2	**3.7**
Project 5 People, livestock and the environment			3.4	0.4	0.2	**4.0**
Project 6 Livestock policy analysis				1.6	0.2	**1.8**
Project 7 Strengthening partnerships for livestock research					3.0	**3.0**
Project 8 System-wide livestock programme	0.3		1.3	0.3	0.1	**2.0**
Undertaking totals	**2.7**	**2.0**	**18.7**	**2.7**	**4.4**	**30.5**

1/ Please refer to Table 2 for the crosswalk between the CGIAR Activities and the new CGIAR Outputs.

Table 2. ILRI Research Agenda - Allocation of Resources, 1999-2003
(expenditure in US$ million)

Allocation of Resources by Outputs
Logical Framework Format

Outputs:	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Germplasm Improvement	2.2	2.4	2.7	2.8	2.9
(Activity: Germplasm Enhancement & Breeding, plus Networks, as appropriate)					
Germplasm Collection	1.8	1.8	2.0	2.1	2.2
(Activity: Saving Biodiversity and Networks)					
Sustainable Production	16.0	17.9	18.7	19.4	19.6
(Activity: Production Systems Dev & Mgmt, Protecting the Environment and Networks.)					
Policy	2.4	2.6	2.7	2.9	3.3
(Activity: Improving Policies and Networks)					
Enhancing NARS	4.1	4.4	4.4	4.4	4.6
(Activity: Strengthening NARS and Networks)					
TOTAL	26.5	29.1	30.5	31.6	32.6

Allocation of Resources by CGIAR Activity

	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Increasing Productivity	15.0	17.1	18.0	18.5	18.7
of which:					
Germplasm Enhancement & Breeding	2.2	2.4	2.7	2.8	2.9
Production Systems Development & Management	12.8	14.7	15.3	15.7	15.8
Protecting the Environment	3.2	3.2	3.4	3.7	3.8
Saving Biodiversity	1.8	1.8	2.0	2.1	2.2
Improving Policies	2.4	2.6	2.7	2.9	3.3
Strengthening NARS	4.1	4.4	4.4	4.4	4.6
of which:					
Training and Professional Development	1.7	1.9	1.9	1.9	2.0
Documentation, Publications, Info. Dissemination	1.3	1.4	1.4	1.4	1.5
Organisation & Management Counselling Networks	1.1	1.1	1.1	1.1	1.1
TOTAL	26.5	29.1	30.5	31.6	32.6

Table 3. ILRI Research Agenda Project and Output Cost Summary, 1999–2003

(in US$ million)

	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Project 1 Systems analysis and impact assessment	2.8	3.3	3.4	3.5	3.5
Project 2 Livestock feeds and nutrition	2.7	2.9	3.5	3.8	4.0
Project 3 Livestock health					
Biotechnologies for disease control	5.2	5.4	5.4	5.2	5.0
Integrated disease control	3.5	3.5	3.7	4.0	4.2
Project 4 Livestock genetics and genomics	3.5	3.5	3.7	3.8	4.0
Project 5 People, livestock and the environment	3.7	3.7	4.0	4.3	4.5
Project 6 Livestock policy analysis	1.7	1.8	1.8	1.9	2.2
Project 7 Strengthening partnerships for livestock research	2.8	3.0	3.0	3.1	3.2
Project 8 System-wide livestock programme	0.6	2.0	2.0	2.0	2.0
Total	**26.5**	**29.1**	**30.5**	**31.6**	**32.6**

Summary by Undertaking:	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Germplasm Improvement	**2.2**	**2.4**	**2.7**	**2.8**	**2.9**
Germplasm Collection	**1.8**	**1.8**	**2.0**	**2.1**	**2.2**
Sustainable Production	**16.0**	**17.9**	**18.7**	**19.4**	**19.6**
Policy	**2.4**	**2.6**	**2.7**	**2.9**	**3.3**
Enhancing NARS	**4.1**	**4.4**	**4.4**	**4.4**	**4.6**
Total	**26.5**	**29.1**	**30.5**	**31.6**	**32.6**

Institutional Cost Components:	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Direct Project Costs	**21.6**	**23.7**	**24.9**	**25.8**	**26.6**
Indirect Project Costs (Overhead)	**4.9**	**5.4**	**5.6**	**5.8**	**6.0**
Total Project Costs	**26.5**	**29.1**	**30.5**	**31.6**	**32.6**

Table 4. ILRI Allocation of Project Costs of CGIAR Outputs, 1999–2003
(in US$ million)

Project	Activity	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Project 1 **Systems analysis and impact assessment**	Germplasm Improvement					
	Germplasm Collection					
	Sustainable Production	2.6	3.1	3.2	3.3	3.3
	Policy					
	Enhancing NARS	0.2	0.2	0.2	0.2	0.2
Project 2 **Livestock feeds and nutrition**	Germplasm Improvement	0.7	0.7	0.9	1.0	1.0
	Germplasm Collection	0.6	0.6	0.7	0.8	0.8
	Sustainable Production	1.3	1.5	1.8	1.9	2.0
	Policy					
	Enhancing NARS	0.1	0.1	0.1	0.1	0.2
Project 3 **Livestock health**	Germplasm Improvement					
	Germplasm Collection					
Biotechnologies for disease	Sustainable Production	4.9	5.1	5.1	5.0	4.8
	Enhancing NARS	0.3	0.3	0.3	0.2	0.2
Integrated disease control	Sustainable Production	3.0	3.0	3.2	3.4	3.6
	Policy	0.3	0.3	0.4	0.4	0.4
	Enhancing NARS	0.2	0.2	0.1	0.2	0.2
Project 4 **Livestock genetics and**	Germplasm Improvement	1.4	1.4	1.5	1.5	1.6
	Germplasm Collection	1.2	1.2	1.3	1.3	1.4
	Sustainable Production	0.7	0.7	0.7	0.8	0.8
	Policy					
	Enhancing NARS	0.2	0.2	0.2	0.2	0.2
Project 5 **People, livestock and the environment**	Germplasm Improvement					
	Germplasm Collection					
	Sustainable Production	3.2	3.2	3.4	3.7	3.8
	Policy	0.4	0.4	0.4	0.4	0.5
	Enhancing NARS	0.1	0.1	0.2	0.2	0.2
Project 6 **Livestock policy analysis**	Germplasm Improvement					
	Germplasm Collection					
	Sustainable Production					
	Policy	1.6	1.6	1.6	1.8	2.1
	Enhancing NARS	0.1	0.2	0.2	0.1	0.1
Project 7 **Strengthening partnerships livestock research**	Germplasm Improvement					
	Germplasm Collection					
	Sustainable Production					
	Policy					
	Enhancing NARS	2.8	3.0	3.0	3.1	3.2
Project 8 **System-wide livestock programme**	Germplasm Improvement	0.1	0.3	0.3	0.3	0.3
	Germplasm Collection					
	Sustainable Production	0.3	1.3	1.3	1.3	1.3
	Policy	0.1	0.3	0.3	0.3	0.3
	Enhancing NARS	0.1	0.1	0.1	0.1	0.1

Summary by Undertaking		1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
	Germplasm Improvement	**2.2**	**2.4**	**2.7**	**2.8**	**2.9**
	Germplasm Collection	**1.8**	**1.8**	**2.0**	**2.1**	**2.2**
	Sustainable Production	**16.0**	**17.9**	**18.7**	**19.4**	**19.6**
	Policy	**2.4**	**2.6**	**2.7**	**2.9**	**3.3**
	Enhancing NARS	**4.1**	**4.4**	**4.4**	**4.4**	**4.6**
	Total	**26.5**	**29.1**	**30.5**	**31.6**	**32.6**

Table 5. ILRI Research Agenda, 1999-2003

Investments by Sector, Commodity and Region (in US$ million)

Production Sectors and Commodities	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Germplasm Improvement					
Crops					
Commodity A					
Commodity B					
Commodity C					
Commodity D					
Livestock	2.2	2.4	2.7	2.8	2.9
Trees					
Fish					
TOTAL					
1/ *Sustainable Production*					
Crops					
Commodity A					
Commodity B					
Commodity C					
Commodity D					
Livestock	24.3	26.7	27.8	28.8	29.7
Trees					
Fish					
TOTAL					
2/ *Total Research Agenda*					
Crops					
Commodity A					
Commodity B					
Commodity C					
Commodity D					
Livestock	26.5	29.1	30.5	31.6	32.6
Trees					
Fish					
TOTAL	26.5	29.1	30.5	31.6	32.6

Region	1999 (actual)	2000 3/ (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Sub-Saharan Africa (SSA)	17.8	19.5	20.4	21.1	21.2
Asia	5.3	6.1	6.4	6.6	8.1
Latin America and the Caribbean (LAC)	2.9	2.9	3.0	3.2	2.3
West Asia and North Africa (WANA)	0.6	0.6	0.7	0.7	1.0
TOTAL	26.5	29.1	30.5	31.6	32.6

1/   Includes overheads.

2/   Equals the sum of sectors/commodities in Increasing Productivity, scaled up to total investments for the Research Agenda.

3/   Expenditure includes US$ 1.53 m special allocation brought forward from the CGIAR Finance Committee made in 1999.

Table 6. ILRI Research Agenda, 1999-2003

Expenditure by Functional Category, and Capital Investments (in US$ million)

Object of Expenditure	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Personnel	12.8	14.2	15.0	15.8	16.3
Supplies and services	10.2	11.2	11.8	12.0	12.5
Operational travel	1.4	1.4	1.4	1.4	1.4
Depreciation	2.1	2.3	2.3	2.4	2.4
TOTAL	**26.5**	**29.1**	**30.5**	**31.6**	**32.6**
Capital Investments	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Physical facilities					
Research	0.2	0.1			
Training					
Administration					
Housing					
Auxiliary units					
sub-total	**0.2**	**0.1**			
Infrastructure and leasehold	**0.1**	**0.1**	**0.2**	**0.1**	**0.2**
Furnishing and equipment					
Farming	0.04	0.04	0.05	0.05	0.05
Laboratory and scientific	0.41	0.45	1.20	1.20	1.30
Office	0.07	0.16	0.10	0.10	0.10
Housing	0.03	0.04	0.04	0.04	0.04
Auxiliary units	0.01	0.02	0.03	0.04	0.04
Computers	0.62	0.75	0.35	0.65	0.60
Vehicles	0.31	0.18	0.25	0.24	0.25
Aircraft					
sub-total	**1.5**	**1.6**	**2.0**	**2.3**	**2.4**
TOTAL	**1.8**	**1.8**	**2.2**	**2.4**	**2.6**
Capital Fund Cash Reconciliation	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Balance, January 1	5.6	5.9	6.4	6.5	6.5
plus: annual depreciation charge	2.1	2.3	2.3	2.4	2.4
plus / minus: disposal gains/(losses)					
plus / minus: other					
minus: asset acquisition costs	-1.8	-1.8	-2.2	-2.4	-2.6
equals: Balance, December 31	**5.9**	**6.4**	**6.5**	**6.5**	**6.3**

Table 7. ILRI Agenda Financing and Summary Statement of Activity, 1999–2001

(in US$ '000)

Member	1999 (actual)		2000 (estimate)	
Unrestricted Grants	(US$)	(nat. currency)	(US$)	(nat. currency)
AUSTRALIA	191		200	
AUSTRIA	175		175	
BELGIUM	121		121	
BRAZIL	6			
CANADA	742		762	
CHINA	20			
DENMARK	609		581	
FRANCE	355		221	
FINLAND	276		346	
GERMANY	763		368	
INDIA	38		38	
JAPAN	441		436	
NETHERLANDS	199		70	
NORWAY	1,144		1,128	
SWEDEN	837		712	
SWITZERLAND	1,097		914	
USA	2,925		2,975	
WORLD BANK 1/	3,930		2,846	
subtotal	**13,869**		**11,893**	

Targeted Grants	1999 (actual)		2000 (est)	
	(US$)	(nat. currency)	(US$)	(nat. currency)
AfDB	278		232	
ADB	299		368	
AUSTRALIA	358		241	
BELGIUM	704		704	
CANADA	29		13	
CFC	17		500	
DENMARK			15	
EU	140		1,350	
FORD FOUNDATION	1,000		1,000	
FRANCE	153		239	
FINLAND	47			
FAO/TCP	33		47	
GEF			750	
GERMANY (includes US$ 0.228 m/ US$ 0.21 m for SLP)	1,367		728	
IDRC	393		425	
IFAD	1,142		671	
ITALY	385		540	
IRELAND	389		392	
JAPAN (includes US$ 0.1 m/US$ 0.1 m for SLP)	1,224		1,173	
KENYA	250		262	
KOREA	20		24	
LEVERHULME TRUST			31	
LUXEMBOURG	18			
NETHERLANDS (includes / US$ 0.117 m for SLP)	92		443	
NORWAY	156		146	
OAU/IBAR	39		150	
OPEC			70	
OTHERS - INTER CENTRE PROGRAMMES etc.	87		252	
ROCKFELLER FOUNDATION	70		47	
SPAIN	50		50	
SWITZERLAND (includes US$ 0.291 m/ US$ 0.263 m for SLP)	603		650	
SOUTH AFRICA	70		70	
UNITED KINGDOM	2,251		2,278	
USA	607		415	
WORLD BANK	352		119	
UNIVERSITY OF NOTTINGHAM			96	
WHO	26		29	
subtotal	**12,649**		**14,520**	

TOTAL GRANTS	**26,518**		**26,413**	

Summary Statement of Activity	1999 (actual)		2000 (estimate)	
Member Grants	**26,518**		**26,413**	
+ Centre Income (other revenues)	**1,453**		**1,139**	
= Total Revenues	**27,971**		**27,552**	
Less:				
Total Expenses	**26,509**		**29,082**	
Surplus (Deficit) of total revenues over total expenses	**1,462**		**-1,530**	

1/ Includes US$1.53 m from CGIAR Finance committee special allocation for SLP (US$ 1.2 m) and Economic Valuation of Animal Genetic Research (US$ 0.33 m) which supports activities continuing in 2000.

Table 8a. ILRI Allocation of Member Financing to Projects by Output, 1999

(in US$ million)

Project	Member	Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS Training	Other
Project 1	Australia	0.02			0.02		0.00	0.00
Systems analysis and	Denmark	0.03			0.03		0.00	0.00
impact assessment	FAO	0.01			0.01		0.00	0.00
	Ford Foundation	0.43			0.41		0.01	0.01
	IFAD	0.47			0.44		0.02	0.01
	Ireland	0.12			0.11		0.00	0.01
	Kenya	0.08			0.08		0.00	0.00
	Rockefeller Foundation	0.03			0.03		0.00	0.00
	South Africa	0.04			0.04		0.00	0.00
	Switzerland	0.09			0.09		0.00	0.00
	United Kingdom	0.67			0.64		0.00	0.03
	USA	0.13			0.13		0.00	0.00
	World Bank	0.03			0.03		0.00	0.00
	Unrestricted+centre inc.	0.65			0.56		0.00	0.09
	Total project	**2.80**	**0.00**	**0.00**	**2.60**	**0.00**	**0.04**	**0.16**
Project 2	Australia	0.13	0.03	0.03	0.07		0.00	0.00
Livestock feeds and	Finland	0.05	0.01	0.01	0.02		0.01	0.00
nutrition	Germany	0.85	0.21	0.17	0.43		0.02	0.02
	IDRC	0.06	0.01	0.01	0.03		0.01	0.00
	Italy	0.14	0.04	0.03	0.07		0.00	0.00
	South Africa	0.01	0.00	0.00	0.01		0.00	0.00
	United Kingdom	0.23	0.06	0.05	0.11		0.01	0.00
	Unrestricted+centre inc.	1.23	0.34	0.30	0.56		0.00	0.03
	Total project	**2.70**	**0.70**	**0.60**	**1.30**	**0.00**	**0.05**	**0.05**
Project 3	Australia	0.04			0.04		0.00	0.00
Livestock health	Belgium	0.14			0.13		0.01	0.00
Biotechnologies for	France	0.08			0.08		0.00	0.00
disease control	Ireland	0.22			0.21		0.00	0.01
	Italy	0.12			0.11		0.00	0.00
	Japan	0.82			0.78		0.02	0.02
	Kenya	0.17			0.16		0.01	0.00
	Rockefeller Foundation	0.02			0.02		0.00	0.00
	United Kingdom	0.69			0.65		0.02	0.02
	WHO	0.03			0.03		0.00	0.00
Integrated disease	Germany	0.09			0.07	0.01	0.01	0.00
control	Belgium	0.23			0.19	0.02	0.01	0.01
	IFAD	0.22			0.19	0.02	0.00	0.01
	OIE	0.02			0.02	0.00	0.01	0.00
	OAU/IBAR	0.04			0.03	0.00	0.00	0.01
	United Kingdom	0.04			0.03	0.00	0.01	0.00
	USA	0.05			0.04	0.00	0.00	0.01
	Unrestricted+centre inc.	5.68			5.02	0.35	0.05	0.26
	Total project	**8.70**	**0.00**	**0.00**	**7.80**	**0.40**	**0.15**	**0.35**
Project 4	Australia	0.17	0.07	0.06	0.03		0.01	0.00
Livestock genetics	Belgium	0.34	0.14	0.12	0.07		0.00	0.01
and genomics	EU	0.02	0.01	0.01	0.00		0.00	0.00
	FAO	0.01	0.01	0.00	0.00		0.00	0.00
	France	0.02	0.01	0.01	0.00		0.00	0.00
	Germany	0.04	0.02	0.01	0.01		0.00	0.00
	IFAD	0.24	0.09	0.08	0.05		0.01	0.01
	Ireland	0.05	0.02	0.02	0.01		0.00	0.00
	Italy	0.03	0.01	0.01	0.01		0.00	0.00
	Japan	0.16	0.08	0.05	0.03		0.00	0.00
	Korea	0.02	0.01	0.01	0.00		0.00	0.00
	Sweden	0.01	0.01	0.00	0.00		0.00	0.00
	United Kingdom	0.61	0.24	0.21	0.12		0.02	0.02
	USA	0.03	0.01	0.01	0.01		0.00	0.00
	Unrestricted+centre inc.	1.75	0.67	0.59	0.36		0.00	0.10
	Total project	**3.50**	**1.40**	**1.20**	**0.70**	**0.00**	**0.05**	**0.15**
Project 5	ADB	0.30			0.25	0.03	0.01	0.01
People, livestock	AfDB	0.28			0.25	0.03	0.00	0.00
and the environment	CFC	0.02			0.01	0.01	0.00	0.00
	FAO	0.02			0.02	0.00	0.00	0.00
	Ford Foundation	0.39			0.33	0.04	0.01	0.01
	IADB	0.14			0.13	0.01	0.00	0.00
	IDRC	0.37			0.31	0.04	0.01	0.01
	Italy	0.05			0.04	0.01	0.00	0.00
	Japan	0.25			0.22	0.03	0.00	0.00
	The Netherlands	0.09			0.07	0.02	0.00	0.00
	United Kingdom	0.03			0.02	0.01	0.00	0.00
	World Bank	0.28			0.25	0.03	0.00	0.00
	Unrestricted+centre inc.	1.48			1.28	0.14	0.00	0.04
	Total project	**3.70**	**0.00**	**0.00**	**3.20**	**0.40**	**0.03**	**0.07**
Project 6	Ford Foundation	0.18				0.17	0.01	0.00
Livestock policy	France	0.05				0.05	0.00	0.00
analysis	Germany	0.16				0.15	0.00	0.01
	Italy	0.05				0.05	0.00	0.00
	Norway	0.16				0.15	0.01	0.00
	Switzerland	0.21				0.20	0.00	0.01
	USA	0.02				0.02	0.00	0.00
	World Bank	0.04				0.04	0.00	0.00
	Unrestricted+centre inc.	0.83				0.77	0.00	0.06
	Total project	**1.70**	**0.00**	**0.00**	**0.00**	**1.60**	**0.02**	**0.08**
Project 7	EU	0.12					0.06	0.06
Strengthening partnerships	Germany	0.01					0.00	0.01
for livestock research	IDRC	0.08					0.04	0.04
	Luxembourg	0.02					0.01	0.01
	Rockefeller Foundation	0.02					0.01	0.01
	South Africa	0.02					0.01	0.01
	USA	0.35					0.18	0.17
	Unrestricted+centre inc.	2.18					0.99	1.19
	Total project	**2.80**	**0.00**	**0.00**	**0.00**	**0.00**	**1.30**	**1.50**
Project 8	Germany	0.21	0.03		0.14	0.03	0.01	0.00
System-wide livestock	Japan	0.10	0.02		0.06	0.02	0.00	0.00
programme	Switzerland	0.29	0.05		0.10	0.05	0.00	0.09
	Unrestricted+centre inc.							
	Total project	**0.60**	**0.10**	**0.00**	**0.29**	**0.10**	**0.01**	**0.09**

Centre totals		Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS Training	Other
Total targeted funding		**12.7**	**1.2**	**0.9**	**8.1**	**1.2**	**0.6**	**0.7**
Total unrestricted funding		**12.3**	**0.9**	**0.8**	**6.7**	**1.2**	**1.0**	**1.7**
Total centre income		**1.5**	**0.1**	**0.1**	**1.2**	**0.0**	**0.1**	**0.0**
	Total allocations	**26.5**	**2.2**	**1.8**	**16.0**	**2.4**	**1.7**	**2.4**

Note:
Values of 0.00 reflect amounts of less than US$ 0.01 million.

Table 8b. ILRI Allocation of Member Financing to Projects by Output, 2000
(in US$ million)

Project	Member	Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS Training	Enhancing NARS Other
Project 1	Denmark	0.01			0.01		0.00	0.00
Systems analysis and impact	EU	0.59			0.56		0.02	0.01
assessment	Ford Foundation	0.43			0.41		0.01	0.01
	GEF	0.36			0.34		0.01	0.01
	IFAD	0.12			0.11		0.00	0.01
	Ireland	0.12			0.12		0.00	0.00
	Kenya	0.08			0.07		0.01	0.00
	Netherlands	0.10			0.09		0.00	0.01
	OAU/IBAR	0.15			0.14		0.00	0.01
	Rockefeller Foundation	0.05			0.05		0.00	0.00
	South Africa	0.04			0.04		0.00	0.00
	Switzerland	0.06			0.06		0.00	0.00
	World Bank	0.33			0.31		0.01	0.01
	United Kingdom	0.60			0.57		0.01	0.02
	USA	0.14			0.13		0.01	0.00
	Unrestricted+centre inc.	0.12			0.09		0.02	0.01
	Total project	**3.30**	**0.00**	**0.00**	**3.10**	**0.00**	**0.10**	**0.10**
Project 2	Australia	0.11	0.03	0.02	0.06		0.00	0.00
Livestock feeds and nutrition	Germany	0.23	0.06	0.05	0.11		0.00	0.01
	IDRC	0.06	0.02	0.01	0.03		0.00	0.00
	Italy	0.15	0.04	0.03	0.08		0.00	0.00
	Kenya	0.01	0.00	0.00	0.01		0.00	0.00
	OPEC	0.07	0.02	0.01	0.04		0.00	0.00
	South Africa	0.01	0.00	0.00	0.01		0.00	0.00
	Switzerland	0.04	0.01	0.01	0.02		0.00	0.00
	United Kingdom	0.12	0.03	0.02	0.07		0.00	0.00
	USA	0.01	0.00	0.00	0.01		0.00	0.00
	Others	0.15	0.03	0.03	0.09		0.00	0.00
	Unrestricted+centre inc.	1.94	0.46	0.42	0.97		0.05	0.04
	Total project	**2.90**	**0.70**	**0.60**	**1.50**	**0.00**	**0.05**	**0.05**
Project 3	Belgium	0.25			0.23		0.01	0.01
Livestock health	EU	0.15			0.15		0.00	0.00
Biotechnologies for disease control	France	0.13			0.12		0.01	0.00
	Ireland	0.22			0.21		0.01	0.00
	Italy	0.11			0.11		0.00	0.00
	Japan	0.64			0.61		0.03	0.00
	Kenya	0.18			0.18		0.00	0.00
	Leverhulme	0.03			0.03		0.00	0.00
	United Kingdom	0.86			0.82		0.02	0.02
	WHO	0.03			0.03		0.00	0.00
	Others	0.04			0.04		0.00	0.00
Integrated disease control	EU	0.09			0.08	0.01	0.00	0.00
	IDRC	0.03			0.03	0.00	0.00	0.00
	IFAD	0.20			0.18	0.01	0.01	0.00
	The Netherlands	0.07			0.07	0.00	0.00	0.00
	United Kingdom	0.04			0.04	0.00	0.00	0.00
	Unrestricted+centre inc.	5.83			5.17	0.28	0.16	0.22
	Total project	**8.90**	**0.00**	**0.00**	**8.10**	**0.30**	**0.25**	**0.25**
Project 4	Australia	0.13	0.05	0.05	0.03		0.00	0.00
Livestock genetics and genomics	Belgium	0.34	0.13	0.12	0.09		0.00	0.00
	Canada	0.02	0.01	0.01	0.00		0.00	0.00
	EU	0.02	0.01	0.01	0.00		0.00	0.00
	FAO	0.05	0.02	0.02	0.01		0.00	0.00
	France	0.05	0.02	0.02	0.01		0.00	0.00
	GEF	0.39	0.16	0.13	0.08		0.01	0.01
	Germany	0.07	0.03	0.02	0.01		0.01	0.00
	IFAD	0.22	0.09	0.07	0.04		0.01	0.01
	Ireland	0.05	0.02	0.02	0.01		0.00	0.00
	Italy	0.03	0.01	0.01	0.01		0.00	0.00
	Japan	0.18	0.07	0.06	0.04		0.00	0.01
	Korea	0.02	0.01	0.01	0.00		0.00	0.00
	The Netherlands	0.09	0.03	0.04	0.02		0.00	0.00
	United Kingdom	0.59	0.24	0.21	0.12		0.01	0.01
	USA	0.05	0.02	0.02	0.01		0.00	0.00
	University of Nottingham	0.10	0.04	0.04	0.02		0.00	0.00
	Others	0.05	0.02	0.02	0.01		0.00	0.00
	Unrestricted+centre inc.	1.05	0.42	0.32	0.19		0.06	0.06
	Total project	**3.50**	**1.40**	**1.20**	**0.70**	**0.00**	**0.10**	**0.10**
Project 5	ADB	0.27			0.23	0.03	0.01	0.00
People, livestock and the environment	AfDB	0.23			0.20	0.02	0.00	0.01
	CFC	0.38			0.32	0.04	0.01	0.01
	Ford Foundation	0.39			0.33	0.04	0.01	0.01
	Germany	0.22			0.19	0.02	0.00	0.01
	IDRC	0.34			0.29	0.03	0.01	0.01
	IFAD	0.14			0.11	0.02	0.01	0.00
	Italy	0.17			0.15	0.02	0.00	0.00
	Japan	0.25			0.22	0.03	0.00	0.00
	The Netherlands	0.08			0.07	0.01	0.00	0.00
	United Kingdom	0.09			0.07	0.02	0.00	0.00
	Unrestricted+centre inc.	1.14			1.02	0.12	0.00	0.00
	Total project	**3.70**	**0.00**	**0.00**	**3.20**	**0.40**	**0.05**	**0.05**
Project 6	ADB	0.03				0.03	0.00	0.00
Livestock policy analysis	CGIAR	0.01				0.01	0.00	0.00
	CFC	0.13				0.12	0.01	0.00
	EU	0.05				0.04	0.01	0.00
	Ford Foundation	0.18				0.17	0.01	0.00
	France	0.06				0.05	0.00	0.01
	Germany	0.04				0.04	0.00	0.00
	Italy	0.08				0.08	0.00	0.00
	Norway	0.15				0.14	0.00	0.01
	Switzerland	0.29				0.27	0.01	0.01
	United Kingdom	0.02				0.02	0.00	0.00
	USA	0.01				0.01	0.00	0.00
	World Bank	0.11				0.10	0.01	0.00
	Unrestricted+centre inc.	0.64				0.52	0.05	0.07
	Total project	**1.80**	**0.00**	**0.00**	**0.00**	**1.60**	**0.10**	**0.10**
Project 7	ADB	0.07					0.04	0.03
Strengthening partnerships for	Belgium	0.11					0.05	0.06
livestock research	EU	0.45					0.23	0.22
	South Africa	0.02					0.01	0.01
	United Kingdom	0.18					0.09	0.09
	Unrestricted+centre inc.	2.17					0.78	1.39
	Total project	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**1.80**
Project 8	Germany	0.21	0.03		0.14	0.02	0.01	0.01
System-wide livestock programme	Japan	0.10	0.02		0.07	0.01	0.00	0.00
	The Netherlands	0.12	0.02		0.08	0.02	0.00	0.00
	Switzerland	0.26	0.04		0.17	0.03	0.01	0.01
	World Bank	1.20	0.17		0.79	0.18	0.03	0.03
	Unrestricted+centre inc.	0.11	0.02		0.05	0.04	0.00	0.00
	Total project	**2.00**	**0.30**	**0.00**	**1.30**	**0.30**	**0.05**	**0.05**

Centre totals		Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS Training	Enhancing NARS Other
Total targeted funding 1/		16.1	1.5	1.1	10.4	1.6	0.8	0.7
Total unrestricted funding		11.9	0.9	0.7	6.5	1.0	1.0	1.8
Total centre income		1.1	0.0	0.0	1.0	0.0	0.1	0.0
	Total allocations	29.1	2.4	1.8	17.9	2.6	1.9	2.5

Note: Values of 0.00 reflect amounts of less than US$ 0.01 million.

1/ Includes US$ 1.53 m from 1999 CGIAR Finance committee special allocation for SLP (US$ 1.2 m) and Economic Valuation of Animal Genetic Research (US$ 0.33 m).

Table 8b. ILRI Allocation of Member Financing to Projects by Output, 2000
(in US$ million)

Project	Member	Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Training	Other
							Enhancing NARS	
Project 1	Denmark	0.01			0.01		0.00	0.00
Systems analysis and impact	EU	0.59			0.56		0.02	0.01
assessment	Ford Foundation	0.43			0.41		0.01	0.01
	GEF	0.36			0.34		0.01	0.01
	IFAD	0.12			0.11		0.00	0.01
	Ireland	0.12			0.12		0.00	0.00
	Kenya	0.08			0.07		0.01	0.00
	Netherlands	0.10			0.09		0.00	0.01
	OAU/IBAR	0.15			0.14		0.00	0.01
	Rockefeller Foundation	0.05			0.05		0.00	0.00
	South Africa	0.04			0.04		0.00	0.00
	Switzerland	0.06			0.06		0.00	0.00
	World Bank	0.33			0.31		0.01	0.01
	United Kingdom	0.60			0.57		0.01	0.02
	USA	0.14			0.13		0.01	0.00
	Unrestricted+centre inc.	0.12			0.09		0.02	0.01
	Total project	**3.30**	**0.00**	**0.00**	**3.10**	**0.00**	**0.10**	**0.10**
Project 2	Australia	0.11	0.03	0.02	0.06		0.00	0.00
Livestock feeds and nutrition	Germany	0.23	0.06	0.05	0.11		0.00	0.01
	IDRC	0.06	0.02	0.01	0.03		0.00	0.00
	Italy	0.15	0.04	0.03	0.08		0.00	0.00
	Kenya	0.01	0.00	0.00	0.01		0.00	0.00
	OPEC	0.07	0.02	0.01	0.04		0.00	0.00
	South Africa	0.01	0.00	0.00	0.01		0.00	0.00
	Switzerland	0.04	0.01	0.01	0.02		0.00	0.00
	United Kingdom	0.12	0.03	0.02	0.07		0.00	0.00
	USA	0.01	0.00	0.00	0.01		0.00	0.00
	Others	0.15	0.03	0.03	0.09		0.00	0.00
	Unrestricted+centre inc.	1.94	0.46	0.42	0.97		0.05	0.04
	Total project	**2.90**	**0.70**	**0.60**	**1.50**	**0.00**	**0.05**	**0.05**
Project 3	Belgium	0.25			0.23		0.01	0.01
Livestock health	EU	0.15			0.15		0.00	0.00
Biotechnologies for disease control	France	0.13			0.12		0.01	0.00
	Ireland	0.22			0.21		0.01	0.00
	Italy	0.11			0.11		0.00	0.00
	Japan	0.64			0.61		0.03	0.00
	Kenya	0.18			0.18		0.00	0.00
	Leverhulme	0.03			0.03		0.00	0.00
	United Kingdom	0.86			0.82		0.02	0.02
	WHO	0.03			0.03		0.00	0.00
	Others	0.04			0.04		0.00	0.00
Integrated disease control	EU	0.09			0.08	0.01	0.00	0.00
	IDRC	0.03			0.03	0.00	0.00	0.00
	IFAD	0.20			0.18	0.01	0.01	0.00
	The Netherlands	0.07			0.07	0.00	0.00	0.00
	United Kingdom	0.04			0.04	0.00	0.00	0.00
	Unrestricted+centre inc.	5.83			5.17	0.28	0.16	0.22
	Total project	**8.90**	**0.00**	**0.00**	**8.10**	**0.30**	**0.25**	**0.25**
Project 4	Australia	0.13	0.05	0.05	0.03		0.00	0.00
Livestock genetics and genomics	Belgium	0.34	0.13	0.12	0.09		0.00	0.00
	Canada	0.02	0.01	0.01	0.00		0.00	0.00
	EU	0.02	0.01	0.01	0.00		0.00	0.00
	FAO	0.05	0.02	0.02	0.01		0.00	0.00
	France	0.05	0.02	0.02	0.01		0.00	0.00
	GEF	0.39	0.16	0.13	0.08		0.01	0.01
	Germany	0.07	0.03	0.02	0.01		0.01	0.00
	IFAD	0.22	0.09	0.07	0.04		0.01	0.01
	Ireland	0.05	0.02	0.02	0.01		0.00	0.00
	Italy	0.03	0.01	0.01	0.01		0.00	0.00
	Japan	0.18	0.07	0.06	0.04		0.00	0.01
	Korea	0.02	0.01	0.01	0.00		0.00	0.00
	The Netherlands	0.09	0.03	0.04	0.02		0.00	0.00
	United Kingdom	0.59	0.24	0.21	0.12		0.01	0.01
	USA	0.05	0.02	0.02	0.01		0.00	0.00
	University of Nottingham	0.10	0.04	0.04	0.02		0.00	0.00
	Others	0.05	0.02	0.02	0.01		0.00	0.00
	Unrestricted+centre inc.	1.05	0.42	0.32	0.19		0.06	0.06
	Total project	**3.50**	**1.40**	**1.20**	**0.70**	**0.00**	**0.10**	**0.10**
Project 5	ADB	0.27			0.23	0.03	0.01	0.00
People, livestock and the environment	AfDB	0.23			0.20	0.02	0.00	0.01
	CFC	0.38			0.32	0.04	0.01	0.01
	Ford Foundation	0.39			0.33	0.04	0.01	0.01
	Germany	0.22			0.19	0.02	0.00	0.01
	IDRC	0.34			0.29	0.03	0.01	0.01
	IFAD	0.14			0.11	0.02	0.01	0.00
	Italy	0.17			0.15	0.02	0.00	0.00
	Japan	0.25			0.22	0.03	0.00	0.00
	The Netherlands	0.08			0.07	0.01	0.00	0.00
	United Kingdom	0.09			0.07	0.02	0.00	0.00
	Unrestricted+centre inc.	1.14			1.02	0.12	0.05	0.05
	Total project	**3.70**	**0.00**	**0.00**	**3.20**	**0.40**	**0.05**	**0.05**
Project 6	ADB	0.03				0.03	0.00	0.00
Livestock policy analysis	CGIAR	0.01				0.01	0.00	0.00
	CFC	0.13				0.12	0.01	0.00
	EU	0.05				0.04	0.01	0.00
	Ford Foundation	0.18				0.17	0.01	0.00
	France	0.06				0.05	0.00	0.01
	Germany	0.04				0.04	0.00	0.00
	Italy	0.08				0.08	0.00	0.00
	Norway	0.15				0.14	0.00	0.01
	Switzerland	0.29				0.27	0.01	0.01
	United Kingdom	0.02				0.02	0.00	0.00
	USA	0.01				0.01	0.00	0.00
	World Bank	0.11				0.10	0.01	0.00
	Unrestricted+centre inc.	0.64				0.52	0.05	0.07
	Total project	**1.80**	**0.00**	**0.00**	**0.00**	**1.60**	**0.10**	**0.10**
Project 7	ADB	0.07					0.04	0.03
Strengthening partnerships for	Belgium	0.11					0.05	0.06
livestock research	EU	0.45					0.23	0.22
	South Africa	0.02					0.01	0.01
	United Kingdom	0.18					0.09	0.09
	Unrestricted+centre inc.	2.17					0.78	1.39
	Total project	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**1.80**
Project 8	Germany	0.21	0.03		0.14	0.02	0.01	0.01
System-wide livestock programme	Japan	0.10	0.02		0.07	0.01	0.00	0.00
	The Netherlands	0.12	0.02		0.08	0.02	0.00	0.00
	Switzerland	0.26	0.04		0.17	0.03	0.01	0.01
	World Bank	1.20	0.17		0.79	0.18	0.03	0.03
	Unrestricted+centre inc.	0.11	0.02		0.05	0.04	0.00	0.00
	Total project	**2.00**	**0.30**	**0.00**	**1.30**	**0.30**	**0.05**	**0.05**

Centre totals		Total	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Training	Other
							Enhancing NARS	
Total targeted funding　　1/		16.1	1.5	1.1	10.4	1.6	0.8	0.7
Total unrestricted funding		11.9	0.9	0.7	6.5	1.0	1.0	1.8
Total centre income		1.1	0.0	0.0	1.0	0.0	0.1	0.0
	Total allocations	**29.1**	**2.4**	**1.8**	**17.9**	**2.6**	**1.9**	**2.5**

Note: Values of 0.00 reflect amounts of less than US$ 0.01 million.

1/ Includes US$ 1.53 m from 1999 CGIAR Finance committee special allocation for SLP (US$ 1.2 m) and Economic Valuation of Animal Genetic Research
(US$ 0.33 m).

Table 9. ILRI Research Agenda Staff Composition, 1999–2003

	1999 (actual)		2000 (est)		2001 (proposal)		2002 (plan)		2003 (plan)	
	Hired by:		Hired by:		Hired by:		Hired by:		Hired by:	
	centre	other	centre	other	centre	other	centre	other	centre	other
Internationally Recruited Staff (IRS)										
Research and Research Support	91	12	92	18	95	20	100	22	105	25
of which:										
Post-doctoral Fellows	*12*		*9*		*9*		*10*		*12*	
Associate Professionals	*16*	*6*	*20*	*11*	*21*	*13*	*25*	*15*	*28*	*15*
Training/Communications	10		9		9		9		9	
of which:										
Post-doctoral Fellows										
Associate Professionals	*3*		*3*		*3*		*3*		*3*	
Research Management	9		10		10		10		10	
of which:										
Post-doctoral Fellows										
Associate Professionals	*3*		*2*		*2*		*1*			
Total IRS	**110**		**111**		**114**		**119**		**124**	
Support Staff	**725**		**707**		**707**		**707**		**707**	
TOTAL STAFF	**835**	**12**	**818**	**18**	**821**	**20**	**826**	**22**	**831**	**25**

Definitions

Internationally Recruited Staff (IRS)

This category includes staff who carry out highly technical/senior functions, as defined by the centre, and they may include personnel hired in the local or regional labour market. Included in this group, but shown separately, are post-doctoral fellows and associate professionals (who may have other titles in different centres), and who often are staff provided by donors as part of a project or other institutional arrangement. Costs for consultants engaged for specific tasks are not personnel expenses and the individuals are not staff; their costs should be calculated in the 'supplies and services' category.

Support Staff

This category includes the numerical majority, in many cases, of personnel at a centre. These are usually, but not necessarily always, individuals hired in the local labour market. They carry out functions which require less demanding skills than for the IRS category. The support staff category does not include seasonal field labour or other individuals engaged on a purely contract basis, for example when a centre contracts with an employment agency to provide security, janitorial and other services. Such costs should be calculated in the 'supplies and services' category.

Table 10. ILRI Cash Requirement, Revenue Flow and Currency Shares, 1999–2001

(in US$ '000)

Monthly Cash Uses and Sources

1999	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cash Requirement	2.069	2.245	2.438	2.522	2.149	1.366	1.250	1.726	1.996	2.165	2.415	2.059
Member and centre Income	5.549	2.100	2.200	2.408	2.620	2.340	0.684	0.569	2.250	2.450	2.605	2.447
Net Monthly Position	**3.480**	**-0.145**	**-0.238**	**-0.114**	**0.471**	**0.974**	**-0.566**	**-1.157**	**0.254**	**0.285**	**0.190**	**0.388**
Accumulated Position	**15.843**	**15.698**	**15.460**	**15.346**	**15.817**	**16.791**	**16.225**	**15.068**	**15.322**	**15.607**	**15.797**	**16.185**

2000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cash requirement	2.156	2.525	2.638	2.522	2.599	2.566	0.750	1.726	1.996	2.165	2.415	2.059
Member and centre income	2.254	2.100	2.200	2.100	2.277	2.340	0.684	0.569	1.750	1.350	2.826	2.417
Net monthly position	**0.098**	**-0.425**	**-0.438**	**-0.422**	**-0.322**	**-0.226**	**-0.066**	**-1.157**	**-0.246**	**-0.815**	**0.411**	**0.358**
Accumulated position	**16.283**	**15.858**	**15.420**	**14.998**	**14.676**	**14.450**	**14.384**	**13.227**	**12.981**	**12.166**	**12.577**	**12.935**

Currency Structure of Expenditures

Currency	1999 (actual)			2000 (estimate)		
	Amount	$ value	% share	Amount	$ value	% share
US Dollar		16.0	60%		17.2	59%
KSh	340	5.8	22%		6.4	22%
Birr	30	3.2	12%		3.7	13%
UK Sterling	1	1	4%		1.2	4%
Others note 1/		0.5	2%		0.6	2%
TOTAL		26.5	100%		29.1	100%

Note:

1/ All other currencies the sum of which accounts for less than 5% of total expenditure.

Table 11. ILRI Statement of Financial Position, 1999–2003

(in US$ '000)

Assets	1999 (actual)	2000 (est)	2001 (proposal)	2002 (plan)	2003 (plan)
Current Assets					
Cash and cash equivalents	16,185	12,935	12,522	12,456	12,172
Accounts receivable					
Donors	3,456	2,917	3,575	3,664	3,808
Employees	125	78	78	78	78
Other	600	750	850	950	1,050
Inventories	1,154	1,246	1,250	1,200	1,200
Prepaid expenses	720	645	665	845	845
Other current assets					
Total Current Assets	**22,240**	**18,571**	**18,940**	**19,193**	**19,153**
Fixed Assets					
Property, plant and equipment	51,268	53,098	55,598	57,998	60,598
Less: Accumulated depreciation	-33,071	-35,371	-38,071	-40,471	-42,871
Total Fixed Assets - Net	**18,197**	**17,727**	**17,527**	**17,527**	**17,727**
Total Assets	**40,437**	**36,298**	**36,467**	**36,720**	**36,880**
Liabilities and Net Assets					
Current Liabilities					
Bank indebtedness					
Accounts payable					
Donors	5,141	2,441	2,407	2,407	2,407
Employees	261	245	250	250	250
Others	1,093	1,110	1,170	1,170	1,185
In-trust accounts	356	325	280	280	275
Accruals and provisions	4,069	3,981	3,981	3,981	3,981
Total Current Liabilities	**10,920**	**8,102**	**8,088**	**8,088**	**8,098**
Long-Term Liabilities					
Total Liabilities					
Net Assets					
Capital invested in fixed assets					
Centre owned	18,197	17,727	17,527	17,527	17,727
In custody					
Capital fund	5,895	6,373	6,456	6,509	6,259
Operating fund	5,425	4,096	4,396	4,596	4,796
Other funds					
Total Net Assets	**29,517**	**28,196**	**28,379**	**28,632**	**28,782**
Total Liabilities and Net Assets	**40,437**	**36,298**	**36,467**	**36,720**	**36,880**

Annexes

Annex I. Project portfolio 2001–2003: Project descriptions and logical frameworks

ILRI logframe

Systems analysis and impact assessment

Livestock feeds and nutrition

Livestock health
> Biotechnologies for disease control
> Integrated disease control

Livestock genetics and genomics

People, livestock and the environment

Livestock policy analysis

Strengthening partnerships for livestock research

System-wide Livestock Programme

International Livestock Research Institute

Narrative summary	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation in developing countries are reduced through sustainable livestock production	• Reduced poverty and environmental degradation with increased food security in agricultural systems with livestock components in the developing world		
Intermediate goal • Livelihoods of resource-poor livestock keepers are sustainably improved • Animal products are more affordable and accessible for the poor • Natural resources are sustainably used and conserved in developing countries	• Livestock productivity in target systems increased • Income derived from livestock in smallholder systems increased • Contribution of livestock to trade increased • Food security and improved nutrition and health of poor people enhanced • Livestock practices used by smallholders in marginal areas are sustainable • Land and water resources involving livestock more effectively used		
Purpose Technological and policy options developed through partnerships and alliances used by stakeholders to improve livestock productivity and conserve natural resources	• Products from all successful ILRI programmes are being adopted and implemented	**Assumptions for achievement of intermediate goal** • Partners transfer options and technologies to direct beneficiaries • Livestock are fully integrated into other agricultural systems	• Technologies generated through ILRI's research are in use at the farm level in 20 targeted areas
Outputs • Information that can be used to select more productive and disease resistant livestock and forages is accessible • Affordable technologies and methodologies to improve livestock productivity and reduce effects of disease and undernutrition are available • Improved understanding of constraints and opportunities for livestock research and development in evolving agricultural systems • Management practices, technologies, policies and research methodologies for sustainable use of the natural resource base supporting agricultural systems involving livestock • Policy options which support sustainable livestock development available • Knowledge and capacity development for livestock research and development provided • Appropriate technical, financial and organisational conditions provided for ILRI's programme implementation	Through partnerships and alliances • Increased use of indigenous breeds and forages for livestock production in at least 20 countries by 2010 • Losses due to trypanosomosis, helminths and tick-borne diseases in target systems in SSA decreased by 5% by 2005 • Losses due to poor nutrition in benchmark sites decreased by 5% by 2005 • ILRI developed technologies and policy options available for target livestock systems by 2010 • Degradation of resources in crop–livestock and grazing systems in developing countries reduced by 5% by 2010 • Policy options and market reforms available for use by national policy makers in target regions by 2010 • No. of trained NARS staff increased by 10% in targeted regions • Resources mobilised to reach the CGIAR recommended target of 9.3% of CGIAR income for livestock by 2005 • Timely programme planning, monitoring and review implemented annually • Streamlined institute structure in place and efficient corporate services support programme implementation by 2002	**Assumptions for achievement of purpose** • Governments provide enabling policy and regulatory environment for the adoption of innovations by NARS • Natural disasters do not overtake research sites and the smallholder systems in which interventions will be adopted • Demand for livestock products will increase as projected and pricing structure will encourage expansion of smallholder systems	• Government policies support the livestock sector in all regions • Livestock sector in developing countries continues to expand

Key assumption: Demand for and access to livestock products is maintained

Project 1. Systems analysis and impact assessment

Objective

This activity contributes, through the use of *ex ante* and *ex post* impact assessment, to ILRI's ability to identify researchable issues that will, if resolved, enhance livestock productivity and increase overall agricultural productivity, reduce poverty and maintain the natural resource base. The objectives of the research are to increase understanding of the evolution of livestock systems and evaluate and quantify the socio-economic and environmental impacts of potential interventions.

Outputs

- A livestock-based priority setting framework developed, maintained and applied that takes account of impacts on poverty, the environment and food security (with projects 5 and 6)
- Methodologies, models and decision support systems that allow evaluation of potential biophysical, economic, social and environmental effects of interventions in dairy and crop–livestock production systems (with projects 5 and 6)
- Information, knowledge and capacity development for systems analysis and impact assessment work provided to partners (with projects 7 and 8)

Gains (impact)

Identification of constraints and possible impact will permit development of more appropriate and targeted policy options and technologies, providing greater economic returns to investment in livestock research and alleviating poverty. Increased impact will consequently lead to measurable increases in investment in livestock research in the coming years.

Duration—Five years

Milestones

2001   Continental-scale livestock databases developed for major production systems and geographical regions of the developing world. Methods for valuing animal genetic resources developed and applied in three case study sites in Africa and Latin America

2002   Transregional analysis of smallholder dairy systems in sub-Saharan Africa, Latin America and Asia completed. Rapid impact assessment methods developed and undergoing field-testing with partners in case study sites

2003   A decision support system for trypanosomosis control developed and applied in Africa. *Ex-post* impacts of smallholder dairy interventions assessed at benchmark sites. Crop–livestock, ecosystem and land-use models applied transregionally, to explore system changes and system evolution within an ecoregional context for priority setting and impact assessment

Users—Decision makers in donor agencies, international and national research and development organisations including ILRI, and other stakeholders

Collaborators

NARS partners: Kenya, Tanzania, Uganda, Ethiopia, Zimbabwe, Burkina Faso, Côte d'Ivoire, The Gambia, ARC, South Africa
ARI partners: Wageningen Agricultural University, The Netherlands; TAMU, University of Florida, University of Georgia, Colorado State University, Michigan State University, University of Vermont, NCGIA, USA; University of Edinburgh, University of Newcastle, Natural Resources Institute, UK; FAO, Italy; ICIPE, Nairobi; ARC, South Africa
CGIAR partners: CIAT, CIMMYT, CIP, ICARDA, ICRAF, ICRISAT, IFPRI, IITA, IRRI
Regional and ecoregional partners: ICASA, ecoregional consortia
Outsourcing: University of Georgia, USA

Cost—US$ 3.4 million in 2001 increasing to US$ 3.5 million in 2003

System linkages—Sustainable production and enhancing NARS

Systems analysis and impact assessment

Hierarchy of activities/objectives	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation reduced through better understanding of agricultural systems and improved targeting of more appropriate technology and policy options	• Reduced poverty and environmental degradation and increased food security in the developing world • Increased and faster adoption of livestock-related technologies		
Intermediate goal Livelihoods of resource-poor livestock keepers are sustainably improved, animal products are more affordable and accessible for the poor, and natural resources are conserved in developing countries, resulting from more efficient and effective livestock research being undertaken by ILRI and partners	• Average income for livestock-keeping households increased • Nutritional status of family enhanced in livestock-keeping households • Income variability and calorific intake variability decreased in livestock keeping households		
Purpose Targeted and improved delivery of technological and policy options developed through partnerships and alliances used by stakeholders to improve livestock productivity while conserving natural resources	• ILRI's published impact analyses are cited by partners and other research organisations • New research activities initiated by ILRI and partners attributable at least in part to impact assessment • Priority setting mechanisms institutionalised in NARS and NGO partner organisations	**Assumptions for achievement of intermediate goal** • Livestock continue to be an important component in smallholder systems in ILRI's target areas • Partners transfer tools, methods, options and technologies to direct beneficiaries	• ILRI technologies are in use at the farm level in targeted areas
Outputs • A practical livestock-based priority setting framework developed, maintained and applied • Methodologies and decision support systems that allow evaluation of potential biophysical, economic, social, and environmental effects of livestock interventions, leading to strategies, policies and recommendations at different stakeholder levels • *Ex ante* and *ex post* impact assessments • Characterisation of global livestock systems and case studies in understanding the evolution of systems in response to change • Knowledge and capacity development for systems analysis and impact assessment work provided	• Priority setting framework applied by at least one partner organisation by 2002 • Models and methods tested in four case study locations by 2003, explaining at least 70% of the variation observed in land use, productivity and technology adoption • Options for changes in livestock sector practices and policies available by 2003 • Two ILRI Impact Assessment Series reports published per year; results published internationally if appropriate • Transregional analysis of smallholder dairy systems in Sub-Saharan Africa, Latin America and Asia published • Target country NARS partners trained in systems analysis and impact assessment increased by 10% by 2003	**Assumptions for achievement of purpose** • Data, methods and recommendations being generated continue to be useful and needed by national partners and others • NARS have the resources to retain and use trained staff	• Needs assessments are carried out, and show that information is generated in response to the needs of partners • Global databases can continue to be accessed in collaboration with partners • Credible analyses are being published in peer-review journals and the results are shown to be used to inform decision-making

Activities	Milestones	Preconditions for implementation of activities	Indicators
• Collection, collation, storage, management and dissemination of primary and secondary data at multiple scales • Development of tools, building of models, development of improved methodologies for rapid impact assessment (RIA) • Integration of crop–livestock models for studying trade-offs in resource use, and development and validation of dynamic/spatial models that predict systems evolution • Assess impacts of system interventions on poverty, environment and food security • Analysis and prediction of evolution of systems, including identification of minimum characterisation data sets at different levels of aggregation, leading to transregional analysis • Disseminate information to policy makers, hold participatory stakeholder workshops, and undertake participatory modelling with stakeholders • Graduate students and partner technical staff are integrated into research projects	• Current ILRI databases on www and CD-ROM by early 2001 • A set of RIA methods being field tested at two case studies sites by the end of 2001 • Crop–livestock models used in at least three *ex ante* impact studies by end of 2001, including one on livestock disease control • Systems evolution model developed for two case study sites by the end of 2002 • Priority setting framework in use in subsequent MTP revisions in 2001 and 2002 • One new *ex post* study and three new *ex ante* studies carried out and published by 2002 • Initial recommendation domains identified for teams in SSA, LAC and Asia by mid-2001 • Dynamic recommendation domains defined for one case study crop–livestock system in East Africa by end of 2001 • ILRI's transregional analysis approach and results published by mid-2003 • One participatory modelling workshop held each year to 2002	• Collaborative relationships with data sources developed and maintained • Adequate secondary data exist • Adequate resources continue to be available for activities • GIS and modelling technologies continue to become more powerful and accessible to more users	• Collaboration increases with a greater number of partners globally, and interchange of databases increases • Project funding for these activities increases over time • GIS and modelling techniques are used by more projects within ILRI. An increasing number of research teams both within and outside ILRI have direct access to GIS expertise

Project 2. Livestock feeds and nutrition

Objective

Ruminants in developing countries depend primarily on native pastures and cultivated forages including cereal and legume residues, and increasingly, fodder trees and shrubs. Feed scarcity and poor nutritional quality are major constraints to increasing productivity. The presence of anti-nutritional factors (ANFs) further limits the ability of livestock to utilise tropical feeds. However, adapted wild and domestic ruminants have evolved fermentation mechanisms to overcome the effect of the ANFs and, perhaps, also to utilise fibrous feeds more efficiently. Exploitation of these mechanisms will enable livestock to better utilise the feeds available. Increased uptake of cultivated forages and fodder trees and shrubs of superior quality will help improve year-round feed supply. Selection of animals that more effectively utilise feed nutrients is another approach. The objectives of this project are to mitigate the effects of inadequate nutrition through identifying opportunities to improve the quantity and quality of livestock feeds and developing and evaluating ways to improve feed-use efficiency for milk and meat production.

Outputs

- Strategies and methods to screen and conserve forage biodiversity (with projects 1 and 5)
- Genetic markers identified and crop genotypes selected for superior quantity and/or quality of their residues (with projects 4 and 8)
- Participatory rural approaches for identifying, evaluating and promoting desirable traits of feed resources (with project 1)
- Strategies and methods to collect, isolate and characterise rumen microbes that enhance the capacity of ruminants to utilise tropical forages (with project 4)
- Strategies to improve the efficiency of utilisation of energy and protein by tropical ruminants (with projects 1, 6 and 7)

Gains (impact)

Enhanced availability and efficiency of utilisation of feed resources will lead to increased productivity of meat and milk by livestock, which will result in higher incomes, better nutrition and improved food security for smallholder farms.

Duration—Ten years

Milestones

2001 Approaches and methods for screening and characterising forage resources, feed value traits and rumen microbes developed and made available to partners

2002 Approaches and methods tested; toxic compounds identified; environmental and genetic effects on feed quality of crop residues estimated; genotype–disease–nutrition interactions appraised

2003 Forage germplasm and strains of rumen microbes characterised; candidate genetic markers of feed quality traits identified

Users—NARS, ecoregional consortia, NGOs, private sector

Collaborators

NARS partners: NARS of Africa, Asia and Latin America
ARI partners: University of Cornell, University of Wisconsin, TIGR, USDA-ARS, USA; CSIRO, ACIAR, University of La Trobe, Australia; NRI, The Rowett Research Institute, UK; CIRAD, France; ID-DLO, The Netherlands; Georg-August-University Goettingen, Germany
CGIAR partners: CIAT, CIMMYT, CIP, ICRAF, ICRISAT, IPGRI, IRRI, SLP
Regional and ecoregional partners: Ecoregional Programmes

Cost—US$ 3.5 million in 2001, increasing to US$ 4.0 million in 2003

System linkages—Germplasm improvement, germplasm collection, sustainable production and enhancing NARS

Livestock feeds and nutrition

Narrative summary	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation reduced through the mitigation of the effects of inadequate livestock nutrition on productivity and sustainability of smallholder livestock producers	• Reduced poverty and environmental degradation and increased food security in the developing world		
Intermediate goal Livelihoods of resource-poor livestock keepers are sustainably improved, animal products are more affordable and accessible for the poor, and natural resources are conserved in developing countries through improved availability and efficiency of utilisation of feed resources	• Average income for livestock-keeping households increased • Nutritional status of family enhanced in livestock-keeping households • Income variability and calorific intake variability decreased in livestock households • Environmental degradation reduced		
Purpose National research organisations, development agencies in the livestock sector, and smallholder livestock producers promote and (or) use sown forages, crops improved for feeding value of their residues, superior strains of rumen microbes, and feeding management strategies that increase livestock productivity	• At least five additional national research organisations in at least five countries apply research strategies for conserving forage biodiversity and at least five additional research institutes apply PRA and crop improvement for feed value by 2003 • NARS and development agencies in at least 10 countries promote improved livestock nutrition by 2005	**Assumptions for achievement of intermediate goal** • Livestock services related to improved nutrition, such as the feed industry and the seed sector (for crops and forages) are supported by governments • NARS are effectively supported by governments	• Livestock extension services, feed industry and related services are functional and effective in at least 10 developing countries by 2005 • Increase in budgets of NARS involved in livestock research by 2003
Outputs • Strategies and methods to screen and conserve forage biodiversity developed • Genetic markers associated with feed quality of crop residues identified • Crop genotypes selected for superior quantity and/or quality of their residues • Participatory rural approaches for identifying, evaluating and promoting desirable traits of feed resources developed • Strategies and methods to collect, isolate and characterise rumen microbes developed • Strains of rumen microbes that enhance the capacity of ruminants to utilise tropical forages identified • Indigenous plants with anti-protozoal effects in the rumen ecosystem identified and active compound(s) isolated and characterised • Strategies to improve the efficiency of utilisation of energy and protein by indigenous and crossbred ruminants in the tropics developed	• Diverse collection of forage germplasm conserved and characterised and available for use by 2003 • Estimates of genetic and environmental effects on quality of crop residues made available by 2003 and genetic markers identified by 2005 • At least one genotype of pearl millet, one of sorghum and one of cowpea with superior feed value identified by 2005 • PRA approaches related to feed characterisation and improvement used by five NARS by 2005 • Methods to characterise rumen microbes used at least by five research organisations by 2005 • a) At least one strain of rumen bacteria with potential to tolerate or degrade antinutritional factors identified by 2003; b) at least one nucleic acid probe to track resistance to anti-nutritional factors developed by 2003 • a) At least one toxic compound in one species (*Acacia*) identified by 2001; b) at least one compound in tropical forages with anti-protozoal or anti-microbial activity identified and characterised by 2005 • Recommended strategies to improve utilisation of nutrients by indigenous and crossbred ruminants applied at least by 5 NARS by 2006	**Assumptions for achievement of purpose** • Functional partnerships with NARS, IARCs and research organisation in developed countries are established • Effective collaboration with other ILRI programmes is established • Convention on biological diversity and intellectual property rights does not limit access to forage genetic resources and rumen microbes	• Memoranda of understanding signed with at least five NARS, IARCs and ARIs and put in operation in at least three countries • At least three cross-programme projects involving feed resources and animal nutrition research are conducted in ILRI in Africa, Asia and Latin America by 2001 • At least three multi-institutional projects on feed resources and animal nutrition research are under execution by 2002

Activities	Milestones	Preconditions for implementation of activities	
• Characterise and conserve forage genetic resources for use as livestock feed • Assess genetic and environmental (crop management) influences on quality of crop residues • Development of tools for crop breeders to identify genotypes of superior fodder properties and inclusion of these traits in crop breeding programmes • Identify and evaluate desirable traits in feed resources by using participatory rural approaches, feed evaluation techniques and molecular characterisation of crop residues • Identify and characterise rumen microbes with capacity to tolerate or degrade antinutritional factors present in tropical forages • Identify, isolate and characterise compounds in tropical plants with anti-protozoal effects in the rumen • Evaluate strategies to improve the utilisation of energy and protein by indigenous and crossbred ruminants in the tropics	• At least 20,000 accessions held in trust in the ILRI gene bank by 2003. 1000 accessions fully characterised by 2003. Seeds of 10,000 accessions available for distribution by 2005 • Quantitative estimates of variation in yield and quality of crop residues due to genetic and environmental factors made by 2003 • a) Methods developed for selection for fodder value used at least by three breeding programmes by 2005; b) yield and (or) quality of superior crop cultivars at least 10% higher than non-improved counterparts • Approaches developed used by at least five NARS and three IARCs or institutions in developed countries • a) At least one strain of rumen bacteria with potential to tolerate or degrade anti-nutritional factors identified by 2003; b) at least one nucleic acid probe to track resistance to antinutritional factors developed by 2003 • a) At least one toxic compound in one species (*Acacia*) identified by 2001; b) at least one compound in tropical forages with anti-protozoal or anti-microbial activity identified and characterised by 2005 • a) One report of genetics–nutrition–disease interaction available by 2002; b) meat and milk output increases of 10% obtained in response to better nutrition by 2006	• Funding to project is adequate • Staffing of project is adequate • Access to study sites is not constrained • Access to animal resources, rumen microbes and feed resources is not constrained	• Budget allocated to project • Number of SSY and technicians working in the project • Agreements with at least five country governments and NARS for the execution of multi-institutional research projects signed and put in operation by 2001 • Agreements for the characterisation, collection and transport (if required) of feed resources, rumen microbes and animals signed and adhered to with/by at least three countries by 2002

Project 3.   Livestock health

Objective

Animal diseases are major constraints to improving the level and efficiency of smallholder livestock production in the developing world. The objectives of this project are to undertake research on improved control of priority livestock diseases by investigating ways of improving the delivery and adoption of currently available animal health technologies in a sustainable way, and, where appropriate, to develop new technologies to increase the impact of animal health improvement programmes. The current research focuses on the endemic vector-borne haemoparasitic diseases while considering other priority diseases for future research.

Outputs

- Tools for determination of comparative impact of livestock diseases on global poverty and food security (with projects 1 and 4)
- Improvement of delivery and adoption of technologies for control and prevention of livestock diseases (with projects 1 and 6)
- Improved health and productivity of livestock through effective prevention and control of ticks and tick-borne diseases and trypanosomosis by rational use of integrated health technologies (with projects 1, 2, 4, 5 and 7)
- Improved understanding of the immune responses to target diseases
- Training of stakeholders to facilitate improved adoption of animal health technologies (with project 7)

Gains (impact)

The research will contribute to improved productivity of livestock in the smallholder farming sector through efficient delivery of existing and new health technologies and decreased dependence on toxic chemicals and drugs to control diseases and hence reduce environmental damage.

Duration—Five years

Milestones

2001   Improved global disease information system available. Evaluation of an anti-disease antigen CP for trypanosomes completed. Commercial partners for delivery of TBD diagnostics identified

2002   Up to 90% of the *T. parva* genome sequenced and candidate vaccine antigens for *T. parva* identified

2003   Factors inducing drug resistance in trypanosomes identified, PCR-ELISA evaluated, drug resistance markers for trypanosome and decision support system for integrated control of trypanosomosis developed

Users—NARS, NGOs, FAO, private sector

Collaborators

NARS partners: LIDIVET, Bolivia; EMBRAPA, Brazil; MoA, Chile; ITC, The Gambia; KARI, KETRI, Veterinary Department, OAU/IBAR, University of Nairobi, Kenyatta University, Egerton University, Kenya; CVLM, Mali; MoA, The Philippines; MoA, University of San Marcos, Peru; Onderstepoort Veterinary Institute, University of Pretoria, South Africa; DLD, Thailand; NARO, AHRC, Makerere University, Uganda; ADRI, Veterinary Department, Sokoine University, Tanzania; Department of Veterinary Services, Zambia; USAID/SADC Heartwater Project, CVL, Zimbabwe; University of Ouagadougou, Burkina Faso; Cheik Anta Diop University, Senegal; MoA, Uruguay

ARI partners: ACIAR, Animal Research Institute, QDPI, Australia; ITM, Catholic University of Louvain, University of Namur, Free University of Brussels, Belgium; CIRAD/EMVT, University of Tours, France; Institute of Microbiology, Free University of Berlin, Germany; ID-Lelystad, Wageningen University, University of Utrecht, The Netherlands; NIAH, University of Obihiro, University of Hokkaido, Japan; Swiss Tropical Institute, Switzerland; AgResearch, New Zealand; FAO, Rome; OIE, Thailand; University of Vienna, FAO/IAEA, Austria; University of Guelph, University of Victoria, Canada; Institute for Animal Health, Moredun Research Institute, Livestock in Development, Universities of Oxford, Cambridge, Edinburgh, Glasgow, Strathclyde and Warwick, UK; University of Massachusetts, University of Missouri, University of Florida, TIGR, WSU, USA

CGIAR partners: ICARDA

Regional and ecoregional partners: CIRDES, Burkina Faso

Outsourcing: Free University of Brussels, ITM, Belgium; TIGR, Washington State University, USA

Cost—US$ 9.1 million in 2001, increasing to US$ 9.2 million in 2003

System linkages—Sustainable production, policy and enhancing NARS

Livestock health

Narrative summary	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation are reduced through use of improved livestock health technologies that enhance productivity and sustainability of agricultural systems in developing countries.	• Reduced poverty and environmental degradation with increased food security in agricultural systems with livestock components in the developing world		
Intermediate goal • Livelihoods of resource-poor livestock keepers are sustainably improved • Animal products are more affordable and accessible for the poor • Natural resources are conserved in developing countries	• Livestock productivity in target systems increased • Income derived from livestock in smallholder systems increased • Contribution of livestock to trade increased • Food security, and improved nutrition and health of poor people enhanced • Livestock practices used by smallholders in marginal areas are sustainable • Land and water resources involving livestock more effectively used		
Purpose Integrated disease control methodologies developed through partnership with NARS, private sector and other stakeholders improved livestock productivity	• Morbidity and mortality due to epidemic diseases reduced by 10% in livestock by 2007 in target countries • 10% reduction in the use of toxic acaricides and drugs through use of integrated disease control strategies for vector-borne diseases by 2007 • Milk and meat production increased between 2–5%, by 2010, due to improved control of diseases of cattle	**Assumptions for achievement of intermediate goal** • Livestock diseases are still a priority in the smallholder sector and alternative control methods are not developed • Ticks, tick-borne diseases and trypanosomosis continue to be a major constraint to improved productivity in smallholder livestock systems in Africa	• Decision support systems, vaccines and diagnostics are in demand for control of diseases in target countries • Commercial companies are active partners in production and delivery of improved disease control tools • Government policies support the livestock sector in all regions

Outputs		Assumptions for achievement of purpose	
Outputs • Determination of comparative impact of livestock diseases on global poverty and food security to improve research prioritisation at ILRI • Improvement of delivery, and adoption of available technologies such as vaccines, chemotherapeutic agents for control and prevention of livestock diseases • Improved health and productivity of livestock though effective prevention and control of ticks and tick-borne diseases through rational and integrated deployment of health technologies such as improved vaccines, diagnostics and decision support systems • Improved health and productivity of livestock through effective prevention and control of trypanosomosis and their vectors through rational and integrated deployment of health technologies such as improved vaccines, diagnostics, chemotherapy and decision support systems • Training of NARS and other stakeholders to facilitate collaboration and improved adoption of ILRI developed animal health technologies	• Improved animal health information systems developed by 2003 • ILRI's investment and research focused on priority diseases identified as constraints to livestock development in Africa and Asia by 2003 • Production systems specific decision aid tools for integrated disease control strategies developed by 2007 • Strategies for integrated control of TBD, incorporating appropriate combination of technologies and methodologies such as vaccines, diagnostics and decision support systems, developed for smallholder dairy in East Africa and for grassland systems of South Africa developed by 2003 • Strategies for integrated control of trypanosomosis, incorporating appropriate combination of technologies and methodologies such as drugs, diagnostics and decision support systems, developed in mixed systems in Lake Victoria Basin by 2003 • Serological and immunological reagents available for identification of protective antigens by 2003	**Assumptions for achievement of purpose** • Private sector and other agencies will be willing to participate in delivery of improved disease control methods • Enabling environment within the NARS for adoption and utilisation of ILRI's outputs	• Increased evidence of privatisation of veterinary services and products • Expansion of national extension services through NGOs and private sector • Improved veterinary services

Activities	Milestones	Precondition for implementation of activities	Indicators for assumptions
• Collect data on livestock diseases through existing regional and international networks • Validate data with secondary information • Perform *ex ante* impact assessment and identify priority diseases for target production systems • Identify key constraints to effective delivery of existing animal health technologies such as live vaccines against ECF and chemotherapeutic agents against trypanosomosis • Modify existing products and disease control methodologies to make them user-friendly for improved adoption in target production systems • Train and assist NARS and other stakeholders in the use of improved disease control technologies • Backstop regional disease control programmes • Define epidemiology of TBDs in target production systems through field and experimental data generated using improved diagnostic and characterisation tools • Develop infection dynamics models for major tick-borne pathogens • Identify additional candidate protective antigens of *Theileria parva* and evaluate these in cattle at ILRI • Introduce integrated TBD control strategies in target production systems • Develop new diagnostics for detection of trypanosome infections and identification of drug resistant markers • Complete epidemiological studies on drug resistance in trypanosomes • Develop methodologies for optimum use of drugs for improved control of trypanosomosis • Complete evaluation of candidate antigens for anti-disease and anti-parasite vaccines against trypanosomosis • Initiate studies on identifying immune responses to CBPP in cattle • Train staff from Africa, Asia and South America in modern epidemiological methods, diagnostics tests and the use of animal health technologies for control of diseases	• Linkages with disease information systems networks established by 2001 • ILRI database on livestock diseases in developing countries available by 2003 • *Ex ante* impact assessment of important endemic and epidemic diseases completed and priority diseases of economic importance identified by 2003. ILRI's target diseases modified following priority setting by 2003 • Constraints analysis on poor adoption of vaccines against tick-borne diseases and trypanocidals completed by 2002 • Quality of ECF vaccine improved by 2003. • NARS staff trained to deploy improved vaccine by 2003 • Donor support for the Biological Services Unit provided for backstopping vector-borne diseases. • Infection dynamic models for theileriosis, babesiosis, anaplasmosis and cowdriosis developed and validated by 2003 • Up to 90% of the *T. parva* genome sequenced by 2002. Additional candidate genes identified for *T. parva* • Integrated disease control strategy based on epidemiological information and infection dynamics models developed for evaluation on farm by 2003 • PCR-ELISAs, antigens for antibody detection tests and molecular markers for trypanosomes evaluated in the field by 2003 • Factors and field conditions that induce drug resistance in trypanosomes identified by 2003 • Decision support system for integrated control of trypanosomosis available by 2003 • Efficacy of cysteine protease and a flagella pocket antigen for protection against *T. congolense* determined in cattle by end of 2001 • Two courses held in epidemiology and diagnostics by 2002	• Livestock diseases are still a priority in smallholder sector and alternative control methods are not developed • Ticks, tick-borne diseases and trypanosomosis continue to be a major constraint to improved productivity in smallholder livestock systems in Africa • Demand for new animal health technologies exists for control of livestock diseases • Resources such as funding, technical and scientific staff and institutional infrastructure are available	• Diseases continue to cause increased morbidity and mortality in livestock • Sale of acaricides and drugs increase in the livestock sector to control vector-borne diseases • The use of improved, highly productive breeds of cattle in smallholder sector continues to decline • Reports of development of acaricide resistance and drug resistance trypanosome populations are on the rise • Newer and more expensive chemicals for vector control continue to be produced by pharmaceutical companies

Project 4. Livestock genetics and genomics

Objective

Animal genetic resources have evolved in diverse environments and carry unique combinations of genes that define productive and adaptive capabilities, which can contribute to sustainable agriculture in low-input production systems. About one-third of the 4000 breeds of livestock world-wide risk extinction. Disease is a major factor limiting livestock productivity in large areas of the tropics and subtropics. The objectives of this project are to document the characteristics of and genetic diversity among indigenous livestock breeds of developing countries, to identify genes controlling tolerance of trypanosomes and resistance to helminths, to design breeding programmes to improve disease resistance and overall productivity in low-input environments, and foster conservation of indigenous breeds.

Outputs

- Create publicly accessible databases of domestic animal genetic diversity in Africa and Asia (with projects 1 and 7)
- Provide tools for characterising and valuing, and setting priorities for conserving and utilising animal genetic resources at local, regional and global levels (with projects 1, 6 and 7)
- Identify and characterise genetic loci controlling trypanosomosis tolerance in cattle and helminthosis resistance in sheep (with project 3)
- Improve the understanding of the genetic basis of resistance to trypanosomosis and helminthosis as a route to genetic improvement and development of therapeutic interventions in livestock (with projects 1 and 3)
- Provide strategies for simultaneous improvement of disease resistance/tolerance and productivity in cattle and sheep and for conservation and sustainable use of animal genetic resources (with projects 1, 6 and 7)

Gains (impact)

Characterisation of animal genetic resources promotes continuing use and conservation of indigenous livestock which are usually more productive than exotics under low levels of input, thus increasing farmers' incomes. Use of disease resistant livestock will contribute to increased productivity, reduced chemical and drug usage and improved environmental health where disease presently constrains production.

Duration—Five years

Milestones

2001 Domestic animal genetic resources information database for SSA first released; on-farm breed survey instrument released to NARS in SSA

2002 Genetic relationships of African sheep, goat and camel and Asian yak and camel breeds complete; genes for trypanosomosis tolerance identified in mice; genetic markers for helminthosis resistance identified in sheep and mice

2003 Characterisation of Asian and African chicken and pigs initiated; case studies completed along with first round economic valuation of traits and breeds; candidate genes for trypanosome tolerance in cattle evaluated; preliminary designs completed for breeding strategies in sheep and cattle

Users—National, parastatal and private breeding programmes; individual livestock producers

Collaborators

NARS partners: NARS in SSA, Asia and LAC
ARI partners: Trinity College, Dublin, Eire; Food, Agriculture and Agro-Industry Research Programme of the European Union's concerted Action Project; BNITM, RIBFA, Germany; NIAH, Shirakawa Institute for Animal Genetics, Japan; FAO, Italy; Institute of Zoology, University of Liverpool, University of Nottingham, UK; Wageningen Agricultural University, The Netherlands; CSIRO Molecular Animal Genome Center, Australia; AgResearch, New Zealand; Hebrew University, University of Haifa, Israel; TAMU, USA
CGIAR partners: System-wide Genetic Resources Programme
Regional and ecoregional partners: ITC, The Gambia; CIRDES, Burkina Faso; SADC, Botswana; ASARECA, Uganda

Cost—US$ 3.7 million in 2001, increasing to US$ 4.0 million in 2003

System linkages—Germplasm improvement, germplasm collection, sustainable production, enhancing NARS

Livestock genetics and genomics

Narrative summary	Indicators	Assumptions	Indicators for assumptions
Overall goal • Poverty is reduced through access to animal genetic resources with enhanced productivity • Food security is improved through use of adapted livestock with high survival and good production potential • Diversity of livestock gene base is conserved	• Reduced poverty and environmental degradation with increased food security in agricultural systems with livestock components in the developing world		
Intermediate goal • Productivity is improved by ensuring that genetic resources are available to meet diverse production environments • Productivity is improved by provision of disease resistant livestock in areas where disease constrains livestock production	• More than 90% of priority livestock breeds of Africa and Asia still exist in 2010 • More than 85% of priority livestock breeds of Africa and Asia remain by 2020 • There is at least one instance of increased utilisation of an existing indigenous breed or use of new crossbred animals based on one or more indigenous breeds by 2020 • Trypanosomosis tolerant cattle with improved performance are released for farmer use in at least one high trypanosome challenge area by 2015 • Helminthosis resistant sheep with improved tolerance are released for farmer use in at least one high challenge area by 2015 • Cattle and sheep production in high trypanosome and helminth challenge areas is increased by 2020		
Purpose • NARS and other stakeholders utilise AnGR evaluation tools to set priorities for genetic conservation programmes and to identify genetic resources useful for genetic improvement programmes • NARS and other stakeholders develop breeding programmes to improve livestock productivity through improved disease tolerance and adaptation	• Client groups frequently add to and extract information from the ILRI AnGR database • At least one breeding programme to improve disease resistance of sheep and cattle is initiated by 2005	**Assumptions for achievement of intermediate goal** • Local cultural and political situations allow uptake of improved AnGR by farmers	• At least one obvious example of uptake of improved germplasm by smallholders by 2010

Outputs		**Assumptions for achievement of purpose**	
• A publicly accessible database of domestic animal genetic diversity is created • Tools for characterising and valuing AnGR are provided • Genetic loci controlling trypanosomosis tolerance in cattle and helminthosis resistance in sheep identified and characterised • Understanding of the genetic basis of resistance to trypanosomosis and helminthosis is improved • Strategies for improvement of disease resistance/tolerance and productivity in cattle and sheep and for conservation and sustainable use of AnGR are provided • Expertise and capacity of staff of NARS and other strategic partners is enhanced through training received by graduate students and staff at ILRI	• AnGR database for cattle and sheep in Africa and Asia released in 2002 • Methods for on-farm phenotypic characterisation of AnGR tested and released for use by 2002 • Methods for economic valuation of traits and breeds tested and released by 2002 • First set of economic values of traits and breeds available in 2003 • Broad-scale mapping of genes controlling helminthosis resistance in mice completed in 2002 • Broad-scale mapping of genes controlling helminthosis resistance in sheep completed in 2003 • Strong candidates for at least two of the genes controlling trypanosome tolerance in mice identified by 2001 • Strong candidates for at least two of the genes controlling trypanosomosis tolerance in cattle identified by 2002 • Strategy document available detailing viable approaches to simultaneous improvement of disease resistance and productivity in cattle and sheep by 2003 • Graduate students successfully complete their studies and are employed or return to employment within NARS and other organisations • Staff of NARS and other organisations take part in ILRI training programmes and utilise new skills in their work setting	• NARS and other stakeholders create policy instruments and devote resources to conservation and utilisation of AnGR • NARS and other stakeholders continue to recognise the social and economic value of genetic improvement programmes and devote appropriate resources to such programmes	• Policies are created and resources are devoted by at least two countries or international organisations by 2003 • Plans for improvement programmes based on at least one indigenous breed commenced by 2003

Activities	Milestones	Preconditions for implementation of activities	Indicators
• Document the phenotypic characteristics and status of African and Asian priority livestock • Estimate genetic diversity and relationships among breeds using molecular genetic markers • Construct an electronically accessible database of information on animal genetic resources • Devise and field test survey instruments for collection of information on phenotypic characters and economic valuation of traits and breeds • Identify chromosomal locations of genes controlling tolerance of trypanosomosis in cattle based on molecular marker mapping in cattle and in mice as a model • Identify the broad chromosomal locations of genes controlling resistance to helminthosis in sheep based on molecular marker mapping in sheep and in mice as a model • Refine the location of genes controlling trypanosome tolerance and helminthosis resistance in mice using molecular marker mapping of advanced intercross generations and, where possible, in cattle and sheep by comparative mapping against mouse results • Identify strong candidate genes for tolerance/ resistance genes by use of mouse/human comparative maps, development of contigs in mice and comparative mapping between cattle and mice/humans • Undertake functional genomic studies of strong candidate genes in mice, cattle and sheep • Develop breeding strategies for improvement of disease resistance and productivity of cattle and sheep in low-input production systems • Experimental evaluation of genetic resistance to helminthosis and integrated control strategies for sheep and goats in South-East Asia • Education and training of students and staff of partners is undertaken by providing a world-class research environment for students and through specific training and capacity building programmes	• First draft characterisation of African cattle breeds is completed in 2001, and for African sheep and goats and Asian yaks in 2003 • Medium level molecular genetic diversity assessment of African cattle breeds is complete in 2001, and of African sheep and camels and Asian yaks by 2003 • Initial field test of phenotypic and economic survey instruments is complete in 2002 • Results of broad-scale mapping of trypanosomosis tolerance in cattle and first fine-mapping in mice are published in 2001 • Results of broad-scale mapping of helminthosis resistance genes of sheep and first fine-mapping of mice published in 2003 • Candidate genes for trypanosomosis are identified in mice and cattle in 2001, with strong candidates identified by 2003 • Study of field relevance of putative genes controlling trypanosomosis tolerance is commenced in 2001 • Initial candidate genes for helminthosis in mice and sheep are identified in 2003 • Functional genomic studies of trypanosomosis tolerance genes of mice and cattle are expanded in 2001 • Publications on design of breeding programmes for introgression of QTL are first produced in 2001 • Strategies for improvement of disease resistance and productivity outlined by 2003 • Ranking of goat and sheep breeds in South-East Asia for helminthosis resistance is completed in 2002 • Experimental evaluation of integrated control strategies for helminthosis is completed in 2003 • A capacity building project for genetic resources and genetic improvement is initiated by 2001	• Sharing of information among AnGR holding countries takes place without major obstacles from sovereignty issues • Collection and movement of DNA for genotyping takes place without major sovereignty or technical barriers • The human genome project delivers the first draft human sequence identifying the majority of mammalian genes by 2001 • Projects on cattle/human homology allow identification of chromosomal location of a given bovine gene with about 90% certainty by 2001	• Information flows from most collaborators regularly and without apparent restriction • Tissue/blood samples arrive at ILRI from most countries on a regular basis • The human genome sequence is published by mid 2001 • Cattle/human homology maps continue to be improved at about the current rate

Project 5. People, livestock and the environment

Objective

Increased demand for livestock products and population pressures place increased demands on the natural resources supporting livestock production and increase competition for land use. Such competition can lead to pollution, erosion, degradation and loss of plant and animal biodiversity, including wildlife. Competition for resources affects the land-use choices of smallholders and increases pressure to convert forested lands to pasture and crops. Trade-offs between short-term increased income and food security for poor people and long-term conservation of natural resources are not well understood, hindering development of interventions and strategies to improve livestock-related natural resource management. This project will develop better strategies, methods and policy options to understand and manage land use and natural resources to help farmers/pastoralists, policy makers and researchers maintain or increase the flow of ecosystem goods and services in livestock production systems over the short and long term.

Outputs

* Global assessment of livestock and environment hotspots—where ecosystems are most fragile and livestock impacts are expected to be highest (with project 1)
* Better information on ecosystems in livestock systems and the impacts of livestock on ecosystem goods and services (with projects 1 and 7)
* Development and testing of new decision support tools, management strategies and policy options to improve land-use and nutrient management in livestock systems (with projects 1, 2, 3, 4, 6 and 8)
* Capacity strengthening for researchers and policy makers in environmentally-sound livestock research and policy (with project 7)

Gains (impact)

This project will contribute to increased flow of goods and services (soil fertility, biodiversity) to resource-poor livestock keepers and promote improved environmentally-sound policy in the livestock sector and a better understanding and information on ways to use livestock to improve ecosystem services. Improved and widely accessible databases on livestock and environment issues will improve the capacity of ILRI's partners to conduct livestock and environment research.

Duration—Ten years

Milestones

2001 Research gaps identified and draft research and financing strategy developed. Participatory appraisal completed and two impact studies initiated in selected sites. Initial livestock–wildlife impact assessment completed

2002 Strategic plans, global assessment, and databases available on CD-ROM and in reports; publication of impact assessments in L&E series reports

2003 Loss of soil fertility and biodiversity reduced in test sites. Publication of impact assessments in peer-reviewed publications

Users—Farmers, policy-makers and researchers

Collaborators

NARS partners: Escuela Centroamericana de Ganadería, MAG, Costa Rica; S&T, MoA, Ethiopia; KARI, KETRI, ACC, KWS, Kenya; MoA, Niger; MoA, Nigeria; AWF, MoA, Tanzania; COCTU, Makerere University, Uganda; WWF, ZNP, Zimbabwe
ARI partners: Oxford, NRI, UK; MSU, CSU, TAMU, World Bank, USA; FAO, Italy
CGIAR partners: CIAT, CIFOR, ICRAF, ICRISAT, IITA
Regional and ecoregional partners: CIRDES**,** Burkina Faso

Cost—US$ 4.0 million in 2001, increasing to US$ 4.5 million in 2003

System linkages—Sustainable production, policy, enhancing NARS

People, livestock and environment

Hierarchy of activities/objectives	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation are reduced through use of improved technologies, methodologies and policies for better natural resource management that enhance productivity and sustainability of agricultural systems in the developing world	• Reduced poverty and environmental degradation with increased food security in agricultural systems with livestock components in the developing world		
Intermediate goal Livelihoods of smallholders improved through sustainable management of natural resources, including better and more integrated management of land use and nutrients in livestock systems that improves the flow of ecosystem goods and services to livestock keepers and other stakeholders	• Soil fertility on farms of livestock-keepers increased • Loss of indigenous biodiversity in target livestock systems reduced • Variability of the flow of natural resources to livestock keepers decreased		
Purpose Technological, methodological and policy options developed through partnerships and alliances used by NARS and other stakeholders to improve natural resource management in livestock systems	• Two new options to improve ecosystem goods and services developed and tested by 2003 • Two new policies that address environmental issues taken up by livestock sector policy makers by 2002, attributable at least in part to information generated through this project • Environmentally sustainable approaches to livestock production institutionalised in ILRI, NARS and NGO partner organisations	**Assumptions for achievement of intermediate goal** • Demand exists for natural resource interventions at the farm level • Policy makers develop environmentally sound policies • NARS and other stakeholders are interested in, have the resources for and implement environmentally sustainable research approaches	• Farmer demand for natural resource management interventions exists and adoption occurs • Policies are implemented which incorporate ILRI-generated information • Short- and long-term benefits of natural resource conservation are appreciated by livestock keepers, NARS and other stakeholders

Outputs	Indicators	Assumptions for achievement of purpose	
Outputs • Global assessment of livestock environment hotspots completed • Better information on ecosystem structure and function in livestock systems and the impact of interventions on the environment is available to NARS and other partners • New natural resource management technologies to improve ecosystem integrity developed and tested • Recommendations for environmentally sound management and policy in the livestock sector are available for stakeholders • Methodologies and decision support systems are available to help decision makers assess the environmental impacts of livestock interventions • Researchers and decision makers have enhanced capacity to conduct/implement environmentally-sound livestock research and policy	**Indicators** • By late 2002, strategic plans, global assessment and databases available on CD-ROM and in reports • Publication of impact assessments in L&E series reports by 2002; in peer-reviewed publications by 2003 • Loss of soil fertility and biodiversity reduced in test sites by 2003 • Changes in livestock sector practices and policies observed • Two decision support systems available on CD-ROM, on a project website and in peer-reviewed publications by 2003 • Eight postgraduate students trained and several workshops for decision makers conducted by 2003	**Assumptions for achievement of purpose** • Technologies, management strategies and policies are useful to stakeholders • Databases and models provide information needed by stakeholders	• Technologies, management strategies and policies are adopted or implemented by stakeholders • Databases, global assessments and decision support tools are used by partners
Activities • Complete hotspot analysis • Identify and implement focused research to fill gaps in understanding of system function • Develop forage germplasm and manure management options in selected areas for testing by NARS; initiate policy and technology studies on integrated nutrient management; conduct valuation of different land-use options • Identify problems and develop decision support tools with decision makers and research collaborators • Identify capacity building needs with stakeholders; conduct workshops and postgraduate studies as needed	**Milestones** • Final strategy, hotspot analysis and spatial databases available by mid-2002 • Reports available and publications submitted by mid-2003 • Germplasm collected or developed for two sites by late 2002, management strategies tested in two sites in SSA by late 2003 • Landmark conceptual paper published on integrated nutrient management by 2003 • Valuation of different land-use options completed by late 2002 for two sites • Strategies and policy recommendations complete for two sub-projects by 2003 • Two decision support tools available on CD-ROM by 2003; two participatory modelling workshops held by late 2001 • Report of capacity building needs completed by late 2001 • Three workshops conducted and eight postgraduate students trained by late 2003	**Preconditions for implementation of activities** • Adequate resources continue to be available for activities • GIS and decision support tools continue to become more powerful and accessible to more users • Decision-makers are interested and able to modify policies and use decision support systems/models	• Funding increases over time in this research area • Increasing number of stakeholders request and use databases and decision support tools • Requests for decision support tools increase; strategies and policies are implemented that reflect, in part, recommendations developed by this project

Project 6. Livestock policy analysis

Objective
Disabling economic policies in the developing regions often constrain smallholder access to input and output markets, new technologies and thus reduce returns to investment in livestock systems, and hinder the sustainable management of natural resources. Distortions in capital markets promote inefficient economies of scale while poor infrastructure and distortions in marketing of livestock products prevent smallholders from adopting new technologies and competing. Inadequate property rights, marketing and pricing policies encourage overgrazing. Information is needed on how policies, institutions and farm level factors interact to enhance technology adoption, promote smallholder participation in markets, and reduce negative environmental effects of livestock production. The objectives of this project are to provide information on the impact and consequences of government policies affecting the livestock sector.

Outputs
- Policy options and strategies to enhance technology adoption and delivery pathways (with project 1)
- Policy and institutional reform options to promote smallholder participation in input and output markets (with project 1)
- Policy, institutional and management options to reduce negative environmental effects of livestock production (with project 5)
- Methods, models and databases available to policy researchers and analysts in developing countries (with project 7)
- Enhanced NARS capacity in policy analysis

Gains (impact)
This project will contribute to increased productivity and incomes for smallholder farmers through increased technology adoption, access to input and markets and better management of the natural resource base by smallholders. Consumers will benefit from lower or stabilised prices. The project will also contribute to development and transfer of analytical tools to policy researchers and analysts in developing countries.

Duration—Five years

Milestones
2001 Inventory of technologies adopted completed and source of inefficiency in markets identified
2002 Review and evaluation of existing policies and effect on resource degradation and technology adoption completed
2003 Inventory of technical, socio-economic and policy constraints to technologies not adopted completed

Users—Policy makers, policy researchers and analysts in the developing countries, NGOs and donor agencies

Collaborators
NARS partners: Mekelle University, EARO, Addis Ababa University, Oromiya Agricultural Development Bureau, Tigray Bureau of Agriculture, Ethiopia; CIRES, Côte d'Ivoire; Makerere University, NARO, Uganda; Ministries of Agriculture and Animal Resources in Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Mali, Niger, Nigeria and Bangladesh; University of Ouagadougou, PSB/GTZ, Burkina Faso; UST, ARI, Ghana; SUA, Tanzania; KARI, KETRI, University of Nairobi, IPAR, Kenya; OMBV, Mali; Federal Livestock Services, Nigeria; NDDB, India
ARI partners: Utah State University, University of Hawaii, University of Wisconsin–Madison, Purdue University, Cornell University, UC Davis, USA; Georg-August University, Germany; Agricultural University of Norway, Norway; CIRAD-EMVT, National Veterinary School of Lyon, France; University of Manitoba Canada; University of Manchester, UK; LEI, The Netherlands
CGIAR partners: IFPRI, SLP; joint staff appointment with IFPRI
Regional and ecoregional partners: ASARECA, Uganda; CILSS, Burkina Faso; CORAF, Senegal; SEARCA, Philippines

Cost—US$ 1.8 million in 2001, increasing to US$ 2.2 million in 2003

System linkages— Policy

Livestock policy analysis

Hierarchy of activities/objectives	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation is reduced through use of information on the impact and consequences of improved policies that enhance productivity and sustainability of agricultural systems in developing countries	• Increased adoption of livestock technologies • Increased incomes for smallholders • Better nutrition and health for producers and consumers • Reduced degradation of the natural resource base		
Intermediate goal Increased capacity for policy analysis in developing countries leading to elaboration of appropriate policy and institutional options to improve livestock systems productivity and sustainable use of natural resources	• Increased productivity, improved NRM achieved through adoption of key policies • Policy analysis units established in relevant government departments		
Purpose Policy makers use information provided to reduce and/or eliminate policy and institutional constraints to improved smallholder access to input and output markets and increased return to investment in livestock systems	• Information provided to policy makers on various options to reduce policy and institutional distortions affecting livestock development	**Assumptions for achievements of intermediate goal** • Policy research results are disseminated effectively • Institutional frameworks to facilitate adoption of policy recommendations are available • Policy makers have access to databases, models, policy documents and reports	• Various reports including policy briefs, working papers are distributed • Policy conferences and policy dialogues organised • Models are well documented and published in user-friendly forms
Outputs • Increased knowledge on policy options and strategies to enhance technology adoption and productivity of livestock production systems • Policy and institutional reform options to promote smallholder participation in input and output markets • Policy, institutional and management options to reduce negative environmental effects of livestock production • Methods, models and databases are made available to policy researchers and analysts in the developing countries • NARS capacity in policy analysis enhanced	• Policy options to improve smallholder technology uptake identified by 2003 • Policy options to improve smallholder access to markets identified by 2003 • Policy and institutional changes needed to reduce negative environmental effects identified by 2003 • Methods, models and tools tested by 2003	**Assumption for achievement of purpose** • Strong partnerships with NARS and policy makers • Strong partnership with IFPRI is maintained • Data on technological options are available from other ILRI programmes and elsewhere	• Memoranda of understanding with NARS • Memoranda of understanding with IFPRI • Publications and reports from other ILRI programmes

Activities	Milestones	Preconditions for implementation of activities	Indicators
• Analyse technology adoption patterns and processes to identify policy related constraints • Analyse policy and institutional factors affecting sustainable management of lands and livestock wastes • Identify economic incentives and constraints to smallholder participation in market-oriented livestock production • Analyse structure, function and efficiency of input/output markets serving smallholders • Assess livestock policy options for improvement of livestock trade • Provide training, capacity strengthening and databases in analysis of policies affecting livestock production, marketing and trade and the environment	• Inventory of technologies adopted completed by 2001 • Inventory of technical, socio-economic and policy constraints to technologies not adopted completed by 2003 • Sources and magnitudes of inefficiencies in markets serving smallholder producers completed by 2001 • Review and evaluation of existing policies and effects on resource degradation completed by 2002 • Secondary information on customary and formal institutions, property rights collected by 2002 • Farm and community surveys on intensification and sustainability of production systems completed by 2002	• Adequate human resources are available in NARS • Adequate funding and staffing for policy research are available • Other programme areas provide support for livestock policy analysis • Effective collaboration with IFPRI and other partners continues • Access to study sites is not constrained • Countries with relevant problems are willing to participate in project	• Staff numbers and composition by discipline • Level of budget • Number of joint activities with other ILRI programmes • Memoranda of understanding with IFPRI • Memoranda of understanding with NARS and partners

Project 7. Strengthening partnerships for livestock research

Objective

The capacity for livestock research is generally weak in NARS, even in those with relatively strong crop research capacity, owing to shortage of trained livestock research scientists, funding shortfalls, isolation from sources of information and limited opportunities for collaborative research. The success of livestock research depends on strong and self-sustaining NARS with expertise in crop–livestock systems research and development, and effective collaboration. The objectives of this project are to strengthen the capacity of national partners for livestock research through training, information services, including Internet-based livestock information systems and collaborative research networks.

Outputs

- Increased research capacity and increased quality and sustainability of education and training for animal agriculture through training of trainers, networking and access to information systems and products (with projects 1, 2, 3, 4, 5, 6 and 8)
- Effective distribution and delivery of information, including Internet-based information systems to NARS, NGOs and farmers (with projects 1, 2, 3, 4, 5, 6 and 8)

Gains (impact)

NARS capacity for research on animal agriculture will be strengthened. More effective linkages will be established among NARS, and partnerships between NARS and ILRI and other crop-based centres will be strengthened. NARS ability to build and sustain their own research capacity will have been enhanced.

Duration—Five years

Milestones

2001 Targeted training for NARS from Asia and WANA/CAC; networks in SSA will have responded to market demands for technology development and provided technical/policy options for mitigating natural/man-made crises facing pastoral livestock production
2002 Training resources on animal genetic resources available to NARS; first phase of virtual SLP implemented
2003 Over 150 NARS scientists world-wide trained; technology transfer and extra funds for NARS research leveraged by networks; at least seven information products released including Internet-based information systems available to global users: training resources on impact assessment, livestock policy and animal nutrition available for use by NARS

Users—NGOs, NARS, FAO, CABI, other CGIAR centres and ILRI research programmes

Collaborators

NARS partners: Developing-country universities, information services, and libraries and livestock research institutes; NGOs
ARI partners: Developed-country universities; CABI; FAO, ICIPE
CGIAR partners: CIAT, CIMMYT, CIP, ICARDA, ICRAF, ICRISAT, IFPRI, IITA, INTG, IPGRI, IRRI, ISNAR, SLP, WARDA
Regional and ecoregional partners: ITC, CIRDES, ASARECA; SACCAR; CORAF

Cost—US$ 3.0 million in 2001, increasing to US$ 3.2 million in 2003

System linkages—Enhancing NARS

Strengthening partnerships for livestock research

Hierarchy of activities/objectives	Indicators	Assumptions	Indicators for assumptions
Goal To improve the welfare of people in developing countries through innovative collaborative research, training and information exchange that promotes sustainable increases in the productivity and sustainability of agricultural systems	• Increase in the contribution of livestock to national GDP • Increase in household incomes and food security • Reduction in imports of livestock and livestock products		
Intermediate goal The new and strengthened capacity created within NARS for R&D is used to contribute towards • Sustainable improvement in livelihoods of resource-poor livestock keepers • More affordable and accessible animal products for the poor • Better conservation of natural resources in developing countries	• Livestock productivity in target systems increased • Income derived from livestock in smallholder systems increased • Contribution of livestock to trade increased • Food security, and improved nutrition and health of poor people enhanced • Livestock practices used by smallholders in marginal areas are sustainable • Land and water resources involving livestock more effectively used		
Purpose Enhanced R&D capacity of NARS results in ability to conduct novel research and to adapt and adopt existing research products thereby contributing to increased livestock productivity of smallholder systems.	• The number of trained technical and scientific staff actively engaged in livestock research and development is increased by 5–10% in participating NARS by 2002 • The number of joint proposals and funding success rate for collaborative research increased by 5% by 2002 • Active and focused regional livestock R&D activities ongoing in all participating NARS by 2001	**Assumptions for the achievement of intermediate goal** • Livestock R&D remains a priority at regional and international levels • Extension mechanisms are in place which allow adoption and increased research productivity resulting in increased output at farm level • Partners are committed to and financially support collaboration	• National funds allocated to livestock R&D maintained or increased • Number of extension staff and activities increase
Outputs • Information/knowledge systems and products are available and information supporting livestock technologies available and disseminated • Training resources are available • Strong linkages established between ILRI and stakeholders • NARS capacity to meet regional priorities for livestock R&D strengthened through collaborative research, targeted training and information exchange	• The number of employees in NARS trained either at ILRI or as a result or ILRI's training resources or by devolution of training exceed 500 in the participating regions by 2003 • More demand driven science-based livestock production technologies and information used by farmers and extension services by 2003 • Adapted and adopted technologies result in a 10% increase in R&D activities by 2003 • Number of knowledge and information products increased by 5%, and use of ILRI web-based information systems and resources increased by 5% by 2003	**Assumptions for the achievement of purpose** • NARS have the resources to retain and use better trained and informed staff • Publications contain important and transferable information • Networking results in genuine collaboration • Networking addresses the real needs and constraints of the smallholder production systems	• Staff benefits increased in NARS • Information products in use • Increased number of collaborative products

Activities	Milestones	Preconditions for the implementation of activities	
The project will work in collaboration with the other ILRI projects and external partners to: • Conduct needs assessment for development and dissemination of information products • Interact with ILRI research to produce and disseminate ILRI information and knowledge • Develop information systems to promote technology transfer and exchange • Provide targeted individual and group training driven by ILRI research which meets NARS needs and supports technology transfer • Conduct impact assessment of past training activities and future needs • Host workshops/seminars to promote exchange of information and knowledge, particularly for South–South exchange • Develop training resources to strengthen NARS research and education • Contribute to the development and implementation of an integrated programme for sub-Saharan Africa (African Capacity Building Initiative) • Undertake joint planning and priority setting with partners for collaborative research activities and training • Strengthen linkages between networks and ILRI research for effective technology development and exchange • Facilitate appropriate linkages and alliances for technology transfer	• Information systems and services provided to both internal and external users • Current ILRI databases for systems analysis and genetic resources on CD and www by early 2001 • Virtual SLP developed and in use by SLP partners by end 2001 • AnGR training materials developed by end 2001 • Impact assessments completed by mid-2001 • Capacity building needs in People, Livestock and the Environment assessed and reported by mid-2001 • Two courses held in epidemiology and diagnostics by the end of 2002 • 80 ILRI publications produced on paper and electronically and distributed by 2003 • 500 NARS staff trained by 2003 through group and individual technical training and graduate programmes • 10 training resources developed and delivered by end 2003 • 10 network research planning and review meetings held by 2003 • 27 issues of networks' newsletters produced by 2003 • At least 6 regional projects and at least 30 operational research projects completed by 2003 in sub-Saharan Africa • Three regional scientific conferences held and their proceedings published by 2003	• Products of ILRI's SPLR programme (training, training materials, information, and network facilitation) continue to be requested by NARS • Repositories for information exist and are accessible to both ILRI and NARS staff • Funding is available to implement the programmes • All collaborators including farmers remain committed	

Project 8. System-wide Livestock Programme

Objective

The System-wide Livestock Programme is a CGIAR research initiative to improve livestock feed resources and natural resource management in crop–livestock agriculture. The SLP works through ecoregional consortia consisting of national agricultural research systems of developing countries, advanced research institutes of developed countries and international agricultural research centres. The objective of this project is to support development of technology and policy options for improved production and utilisation of feed resources in rainfed crop–livestock systems and natural resource management.

Outputs

- Improved supply, quality and quantity of livestock feeds through use of forage legumes, fodder shrubs and crop residues (with projects 2 and 4)
- Strategies and technologies for integrated food/feed production systems developed (with projects 1, 2 and 5)
- Models for constraint analysis and delivery of technologies in smallholder crop–livestock systems developed (with projects 1 5 and 7)

Gains (impact)

This research will contribute to sustainable increases in productivity of target production systems within the ecoregions, leading to increased food security and reduction of poverty. Better use of feed resources and reduced competition for nutrients (for livestock and crops) in smallholder systems will also contribute to improved natural resource management and reduced environmental degradation.

Duration—Five years

Milestones

2001 Selected food crops with improved feed value of residues identified
2002 Case studies on policy interventions for sustainable crop–livestock integration among smallholders and first phase of virtual SLP implemented
2003 Crop–livestock model for managing natural resources in smallholder systems

Users—Farmers, NGOs and NARS

Collaborators

NARS partners: Members of CIAT-led consortium for the humid and subhumid tropics; the ICARDA-led consortium for the subtropics with winter rainfall; the ICRAF-led consortium for the cool African tropics; the Desert Margin Programme led by ICRISAT; the Ecoregional Programme for the Humid Subhumid Tropics led by IITA; the Global Mountain Forum led by CIP; and the Rice–Wheat Consortium led by CIMMYT/IRRI
CGIAR partners: CIAT, CIMMYT, CIP, ICARDA, ICRAF, ICRISAT, IFPRI, IITA, IRRI

Cost—US$ 2 million per year is required to support this project

System linkages—Germplasm improvement, sustainable production, policy and enhancing NARS

System-wide Livestock Programme

Narrative summary	Indicators	Assumptions	Indicators for assumptions
Goal Poverty, hunger and environmental degradation are reduced through use of improved technologies and livestock that enhance productivity and sustainability of agricultural systems in the developing world	• Reduced poverty and environmental degradation with increased food security in agricultural systems with livestock components in the developing world		
Intermediate goal • Livelihoods of resource-poor crop–livestock producers sustainably improved • Natural resources are conserved in smallholder crop–livestock systems in developing countries	• Productivity of crop–livestock systems increased		
Purpose Through partnerships with other CGIAR centres and ecoregional programmes, feed and NRM technology and policy options developed to improve productivity of crop–livestock systems and conserve natural resources	• Products of SLP research being implemented by NARS and other stakeholders	**Assumptions for achievement of intermediate goal** • NARS transfer options and technologies to direct beneficiaries	• SLP technologies are in use at the farm level in target areas
Outputs • Strategies and technologies for integrated food/feed production systems developed • Models for constraint analysis and technology targeting developed • Case studies on implications for increasing demand for livestock feeds on food security and food/feed markets • Strategies and technologies for improved natural resource management developed	• QTLs for feed quality identified (sorghum, millet) and elite lines of food feed crops based (cowpea, groundnuts, maize) • Herbaceous legumes (five) for multiple uses identified and tested in benchmark areas and pilot sites • Superior trees and shrubs (six) identified and tested in benchmark and pilot sites in WANA • Productivity of smallholder mixed systems increased by 10% in benchmark areas • Policy recommendations on food/feed markets being used by national programmes in South-East Asia and SSA • Integrated food/feed production systems being tested in pilot sites in SSA	**Assumptions for achievement of purpose** • Developing smallholder crop–livestock systems remains an important recommendation domain for national and international research • Strong ecoregional and national partnerships • Research support for national programmes strengthened • Donor support for the SLP continues	• Reports of NARS and CGIAR • Budgets of NARS, SLP and ILRI
Activities • Evaluation of germplasm of main food crops for livestock feed quality traits • Evaluate agronomically elite lines of herbaceous legumes and dual-purpose crops for augmenting feed quality and supply and for contributions to soil improvement • Parameterising, specifying and testing crop–livestock models for quantifying trade-offs in resource use • Develop databases to test spatial crop–livestock models for natural resource management • Analyse role of policies on intensification of crop–livestock production systems and smallholder participation in food/feed markets	**Milestones** • Germplasm of main food crops with superior feed quality identified by end of 2001 • Elite multiple purpose legumes being tested on smallholder farms in benchmark areas by 2002 • Case studies of the impact of policies on crop–livestock systems intensification published by 2002 • Crop–livestock model for managing natural resources being tested in case study agro-ecological zones by 2003	**Preconditions for implementation of activities** • ILRI's and participating centres' budgets remain stable or increase	• Livestock and livestock-related research remain important targets of national and international research

Annex II. A framework for assessing priorities

A quantitative priority assessment framework, which allows a link between agreed priorities and resultant resource allocations was developed in 1999 in response to an explicit request contained in TAC's commentary on the recent External Programme and Management Review of ILRI. Such a framework is both timely and valuable for ILRI. First, it provides an opportunity to link priority setting in a systematic way with the considerable amount of recent work at ILRI on impact assessment. This will enable more informed decision making. Second, it is a way to identify gaps in knowledge of the economic significance of global livestock constraints, and thus it allows ILRI to further enhance its reputation as a centre of excellence with knowledge of the challenges and opportunities for global livestock research and development. Third, such a framework can assist ILRI in its funding and marketing strategies, by allowing the agreed priority agenda to drive funding, rather than the reverse.

The framework and complete analysis is a companion document to *ILRI Strategy to 2010* and the 2001–2003 medium-term plan and is published in a monograph *Priority Assessment for the International Livestock Research Institute, 2000–2010*. ILRI Impact Assessment Series 6, 2000.

The process

Given the need for a new strategic plan and a transparent process and framework for helping ILRI to allocate resources to many different research activities, a participatory strategic planning and priority assessment process was embarked upon. A Board–Management *Ad Hoc* Committee on Strategic Principles oversaw the process, and a Steering Committee made up of ILRI management and staff was formed to develop and implement the strategic planning process. The process took as a starting point a major series of consultations with partners and stakeholders conducted between 1995 and 1998 in Asia, Latin America and West Asia–North Africa.

The 1999 strategic planning process consisted of several distinct components (Figure 1.1). A comprehensive background paper was prepared that considered the external environment affecting ILRI and its future direction. A priority assessment framework was developed and a working group established to develop a set of measurable criteria that could be used to inform decisions about priorities so as to reflect the goals of the CGIAR and the vision of ILRI. Six thematic Focus Groups were established, covering the major research and related areas in which ILRI might work in the future:

- Application of genomics and the conservation and use of genetic resources
- Improvement of feed utilisation and animal nutrition
- Improvement of animal health
- Sustainable improvement of production systems: improving livestock productivity and natural resource management
- Integrated systems analysis: livestock policy analysis, decision support systems and economic and environmental impact assessment
- Capacity building, strengthening partnerships and knowledge brokering to improve livestock productivity.

The Focus Groups prepared background papers describing the external environment, identifying the needs, problems, opportunities and possible areas of future research as the basis of discussions in the subsequent workshops held by each Focus Group. The Focus Groups consisted of both ILRI scientists and managers and external participants. ILRI participants included both those primarily interested in the discipline being considered by the Focus Group, as well as others from related disciplines to facilitate interdisciplinary solutions emerging. The external participants represented a wide variety of interests: regional organisations, acknowledged experts in the relevant disciplines and representatives of potential partners such as NARS, NGOs or the private sector. The composition of the Focus Groups, and the brief they were given, helped to ensure that their outputs reflected a demand-driven rather than a supply-driven perspective.

STRATEGY

CGIAR strategies and priorities

↓

Assessment of external influences — Global needs

↓

Definition of key research areas — Global constraints

↓

Identification of strategic approaches — Global research opportunities

↓

Formulation of research and related outputs, preparation of theme briefs — Potential demand for ILRI research

↓

Approval of strategy by Board and review by TAC

↓

Priority assessment of themes — Linking priority and impact assessments

ILRI priority assessment process

MEDIUM-TERM PLAN

Ordinal ranking of themes with notional resource requirements

↓

Impact assessments

Priority setting by management with notional resource allocations — ILRI priorities and resource allocations

↓

Preparation of medium-term plans and log frames

TAC/CGIAR approval of medium-term plan

↓

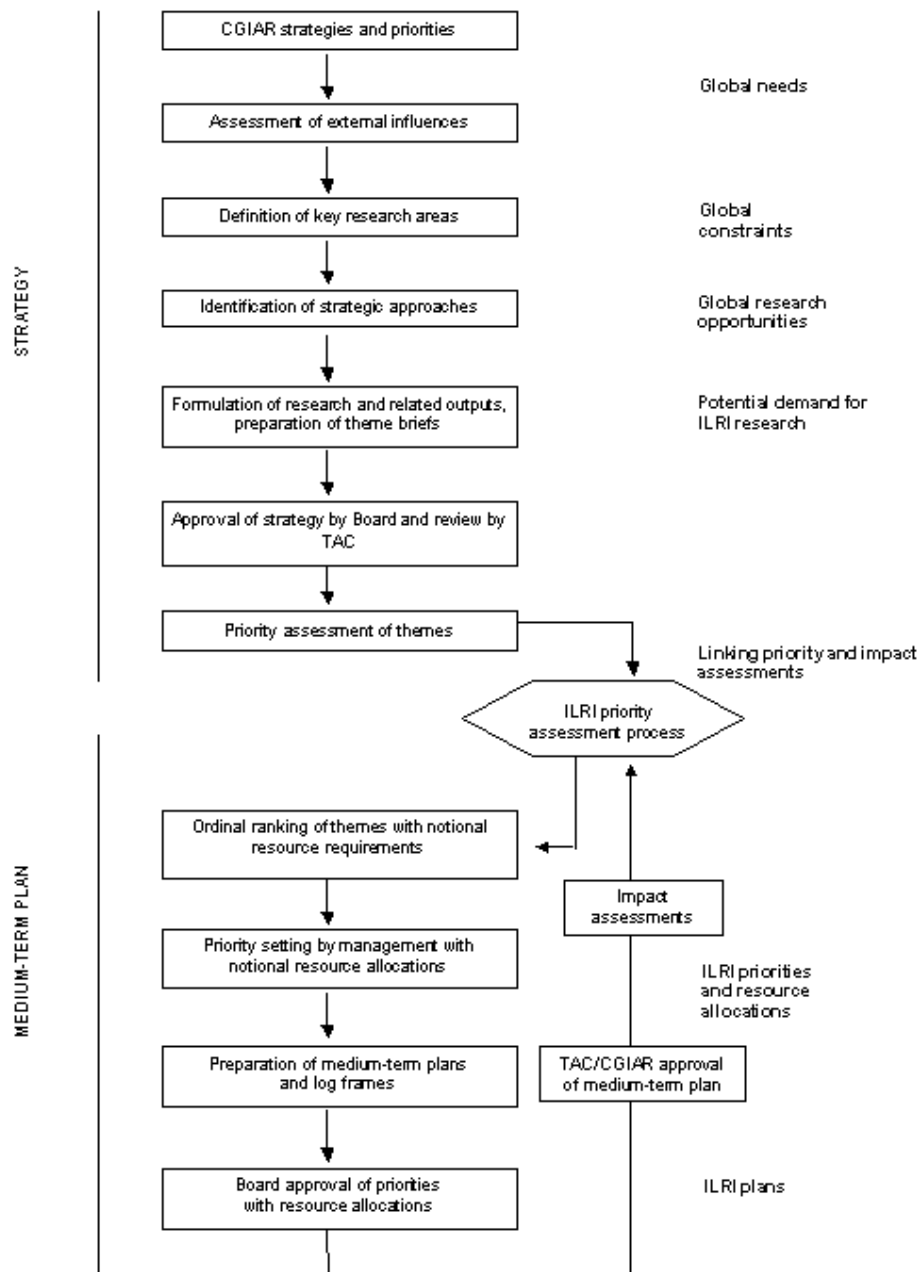Board approval of priorities with resource allocations — ILRI plans

Figure 1.1 *The ILRI strategic planning process.*

59

The Focus Group workshops were asked to assess the needs in livestock research to the year 2010, to identify potential opportunities and suggest research and associated activities that could contribute towards addressing the needs. This was done in the context of prospective impact on poverty, awareness of the alternative suppliers and ILRI's comparative/complementary advantage, researchability, feasibility and whether the outputs were international public goods (Figure 1.2). The outputs of the workshops were summary reports containing descriptions of the constraints and opportunities identified and a total of 45 research and research-related theme briefs that described the activities proposed by the workshop participants.
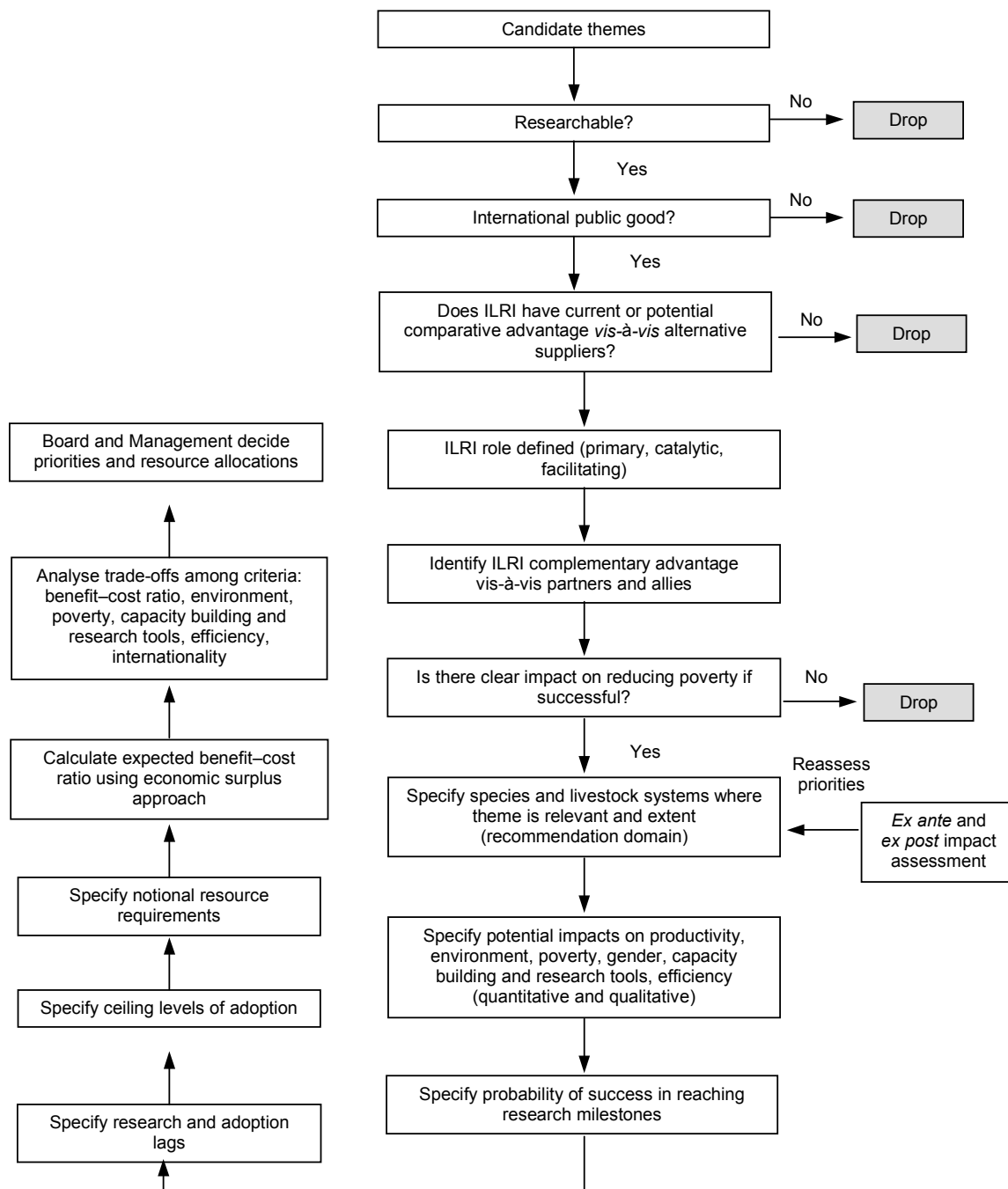
```
                                    ┌──────────────────────────┐
                                    │     Candidate themes     │
                                    └──────────────────────────┘
                                                  │
                                                  ▼                       No
                                    ┌──────────────────────────┐ ───────────► ┌────────┐
                                    │      Researchable?       │              │  Drop  │
                                    └──────────────────────────┘              └────────┘
                                                  │ Yes
                                                  ▼                       No
                                    ┌──────────────────────────┐ ───────────► ┌────────┐
                                    │ International public good?│              │  Drop  │
                                    └──────────────────────────┘              └────────┘
                                                  │ Yes
                                                  ▼                       No
                                    ┌──────────────────────────┐ ───────────► ┌────────┐
                                    │  Does ILRI have current  │              │  Drop  │
                                    │  or potential comparative│              └────────┘
                                    │  advantage vis-à-vis     │
                                    │  alternative suppliers?  │
                                    └──────────────────────────┘
```


Figure 1.2. *ILRI priority assessment process.*

After the planning workshops had taken place and the summary reports and theme briefs circulated, a facilitated Strategic Planning Workshop was held. The Focus Group chairs and rapporteurs and members of the Steering Committee, Institute Management Committee and the Priority Assessment Criteria Working Group attended this workshop. The objective was to review the outputs of the planning workshops and synthesise them into an integrated whole. Between them the Focus Groups had described 32 problems which were subsequently clustered into eight major problems. From these eight problems, 12 strategic approaches were derived which were the potential solutions to the problems. The 45 themes previously proposed by the Focus Groups were arrayed against the problems and strategic approaches to which they would make a major contribution. Because of overlaps and synergies between the briefs, in October and November the 45 themes were collapsed, through mergers, to 26 themes, for which comprehensive descriptive briefs were prepared and the data in them validated (Table 1).

Table 1. Themes considered in the priority assessment framework

Ensuring Future Viability of Smallholder Systems
Prioritisation of Livestock Research Needs
Understanding Systems Evolution

Increasing Feed Quantity and Quality through Genetic Enhancement
Increasing Livestock Productivity through Improved Feed Conservation
Improving Feed Utilisation through Enhanced Rumen Function
Breeding for Improved Feed Utilisation Efficiency

Comparative Global Impact Assessment of Livestock Diseases
Improving Delivery, Adoption, and Impact of Technologies
Improved Prevention and Control of Ticks and Tick-Borne Diseases
Improved Prevention and Control of Trypanosomosis

Assessment and Valuation of Animal Genetic Resources
Identification and Characterisation of Genetic Resistance to Disease
Genetic Improvement and Delivery Strategies

Strategies to Improve Nutrient Supply
Reducing Environmental Costs of Intensive Livestock Systems
Land Use Strategies to Increase Production and Protect the Environment
Improving Rangeland Systems
Policies for Improved Management of Forest-Derived Grazing Lands

Participatory Policy Research to Improve Technology Adoption
Policies for Improving Natural Resource Management
Reforming Input and Output Markets
Using Different Species to Reduce Variability of Production and Food Security

Strengthening Capacity—Training
Strengthening Capacity—Information
Strengthening Capacity—Networking

The criteria

The framework revolves around five primary criteria by which priorities are assessed. These reflect the vision, mission and mandate of ILRI and the priorities and strategies of the CGIAR:

- Contribution to poverty reduction
- Expected economic impact within an economic surplus framework
- Environmental impact
- Internationality of the problem
- Contribution to capacity building, development of new research tools, and improved research efficiency.

Poverty: Data obtained from TAC and FAO on poverty were arrayed into the livestock production systems defined by Seré and Steinfeld (*World livestock production systems: current status, issues and trends*. FAO Animal Production and Health Paper 127. FAO, Rome, Italy, 1996) for each of six geographic regions: sub-Saharan Africa, South Asia, South-East Asia, East Asia, Latin America and the Caribbean, and West Asia and North Africa. This enabled matching the extent of poverty in the same recommendation domains used to estimate the benefit–cost ratios. In the framework, poverty is measured as the relative severity of poverty in the livestock production systems in a region where the research or related activities are relevant and expected to have economic impact, weighted by the numbers of poor in those same systems. The higher these number the greater the priority of the theme. This consideration is additional to the earlier *necessary condition* that there clearly be a potential impact on poverty, without specifying the likely extent of that impact, as is done here. This measure hence incorporates both the depth and the breadth of poverty.

The relative severity of poverty in a system or region is measured by *P,* where:

if $W < Z$, then $P = (1 - W/Z)^2$ or

if $W > Z$, then $P = 0$

where W is the adjusted per capita income measure, Z is a threshold income level per capita, chosen to be US$ 6000, P is the poverty measure, and $W = (1 - G)Y$, where G is the Gini coefficient, which measures the extent of income inequality, and Y is the per capita income at purchasing power parity. The lower the adjusted income measure W, the higher is P. If all income is distributed equally in a region, then G is 0 and W is the same as Y, the average per capita income. If all income is in the hands of one individual, then G is 1 and the adjusted income measure W is 0. The relative poverty measure P is unitless and has a range from 0 to 1; the greater the value of P the greater is the severity of poverty. TAC used these measures in the 1996 priorities and strategies exercise and ILRI obtained the database from TAC to use in the analysis.

The poverty analysis thus assumes that the expected economic benefits and impact will flow to the poor in the same proportion as the relative severity of poverty or estimated number of poor in the recommendation domains of the various research themes. While this is a broad assumption, there are currently no better data on a global basis with which to consider poverty as a criterion in assessing priority.

For the poverty indicator, top-ranked themes exhibited a combination of broad recommendation domains where the numbers of poor people were relatively high, and multiple livestock species were important in agricultural systems.

The five top-ranked research themes: Poverty

Improving Rangeland Systems
Using Different Species to Reduce Variability of Production and Food Security
Participatory Policy Research to Improve Technology Adoption
Policies for Improved Management of Forest-Derived Grazing Lands
Ensuring Future Viability of Smallholder Systems

Expected economic impact: The reduction in the cost of production per tonne of the products concerned is calculated from the estimates of the productivity gains expected in livestock production in each candidate theme. This is then applied to the current production levels across the livestock production systems and geographic regions specified as being relevant to the research theme (the research or recommendation domains), in an economic surplus framework that has been used extensively in ILRI over the past four years for assessing impact. The economic surplus is multiplied by the probabilities of success to arrive at expected maximum economic benefits. Then the adoption profile is applied, based on the projected ceiling levels of adoption and the time it will take to reach them to arrive at the stream of estimated actual annual economic benefits from the time research generates adoptable technology options, to when ceiling levels of adoption occur.

The notional resource requirements and the research lags specified in the briefs is then used, along with the stream of annual economic benefits, to calculate the discounted present value of the net

benefit streams and the discounted costs. From this is derived the expected net benefit-to-cost ratio for each research theme.

The top ranked themes using the benefit cost ratio arose because of a combination of factors: wide recommendation domains, relatively short research period, high probability of success and relatively short adoption period. The top-ranked theme in this case, reducing the environmental costs of intensive livestock systems for the urban and rural poor, is aimed at the intensive systems of South Asia, South-East Asia and Latin America.

The five top-ranked research themes: Economic impact

Reducing Environmental Costs of Intensive Livestock Systems
Increasing Livestock Productivity by Improved Feed Conservation
Using Different Species to Reduce Variability of Production and Food Security
Genetic Improvement and Delivery Strategies
Improving Delivery, Adoption and Impact of Technologies

Environmental impact: Each of the proposed research briefs was assessed for potential environmental and public health impacts, assuming successful application of the product(s) and outputs proposed in each brief. Environmental and public health impacts were distinguished in three ways: 1) by the environmental property affected (e.g. water resources, biodiversity), 2) by the fragility of the property or ecosystem affected, and 3) by the likelihood that the intervention will lead to extensification of agricultural systems. The analysis was focused on the likely direct (immediate) impacts of the intervention on selected environmental properties and the index was used for the likelihood of extensification as a simple attempt to assess more indirect impacts, over the medium and longer term. For public health impacts, the analysis was restricted to the impacts of research interventions on human zoonotic diseases. Immediate or direct impacts were assessed on one public health and five environmental properties. The environmental properties were soil resources, water resources, greenhouse gas emissions, non-domesticated biodiversity and domesticated biodiversity. The final environmental index for each research brief was thus made up of weighted scores for each of these impacts. The research themes that came out top using the environment criteria were clearly those most directly related to environmental issues.

The five top-ranked research themes: Environment

Policies for Improved Management of Forest–Derived Grazing Lands
Policies for Improving Natural Resource Management
Landuse Strategies to Increase Production and Protect the Environment
Improving Rangeland Systems
Reducing Environmental Costs of Intensive Livestock Systems

Internationality: To reflect the need for ILRI to select a research portfolio that explicitly reflects its global mandate, a measure of the internationality of the problems that each theme is planning to address is used. This is derived from the information in the briefs on the recommendation domains where the proposed research is judged relevant, in livestock production systems and geographic regions.

Simpson's Index of Diversity I_k is calculated from:

$$I_k = \Sigma_m (S_{km}/100)^2$$

where k is the research theme, m is the country or region or livestock system, and S_{km} is the share of the economic impact resulting from k and realised in m. From this a variable $(1 - I_k)$ can be defined, such that the higher value the greater the 'internationality'.

Capacity building, research tools, research efficiency outputs: From the theme briefs, an index was created that distinguishes among themes whether these outputs are primary, secondary or minor.

The Focus Groups were asked to take a disaggregated view by identifying if and how research briefs had an impact on capacity building and research efficiency according to five sub-criteria:

1. Strengthened national human resources for research
2. Strengthened national institutions for research
3. Improved research tools adapted to national research needs
4. Improved national human resources for development
5. Improved national and local institutions for development.

If activities and outputs under a theme had a direct focus on any of these five sub-criteria, then its impact was considered to be 'important' and it was given a value of 2. If activities and outputs under a theme had an indirect focus on any of these five sub-criteria, then its impact was considered to be 'incidental' and it was given a value of 1. If activities and outputs under a theme did not focus on any of these five sub-criteria, then its impact was considered to be 'not applicable' and it was given a value of 0. The maximum score that a theme could attain for its impact on capacity building and research efficiency was therefore 10.

The composite index

Given the information generated on the five criteria outlined above (economic impact, poverty, environment, internationality and capacity building–research efficiency–research tools), some method is needed that will facilitate priority assessment. This is done by taking each normalised index and weighting these to produce a single, integrated index for each theme. With an appropriate set of weights W_{ki} on each theme k and criteria i, we arrive at a weighted average composite index CI_k, which combines normalised measures of each of the five criteria C_{ki} as follows:

$$CI_k = \Sigma_i\, C_{ki}\, W_{ki}$$

In the participatory spirit of the rest of the priority setting work, weights were elicited for the five criteria from various groups—the Steering Committee, the Focus Groups, and ILRI's Board of Trustees all had input to this process. While these represent arbitrary scaling, if it is accepted that there are indeed multiple objectives to be achieved in the conduct of publicly funded international agricultural research, and that often there are trade-offs among alternative research themes in their achievement, it is inescapable that some form of weighting be used to assess thematic priorities. These can be either explicit or implicit. A composite index approach makes the process explicit.

Results of the priority assessment exercise for the 26 research and related briefs are discussed in detail in *Priority Assessment for the International Livestock Research Institute, 2000–2010*. Impact Assessment Series Number 6.

Future development of the priority assessment framework

Improvement of the priority assessment framework is a continuing priority over the medium term as part of ILRI's systems analysis and impact assessment research. Particular emphasis will be given to improving the information base on elasticities, poverty location and links to livestock, productivity improvements, environmental impacts and delivery pathways. Results from the economic surplus analyses and the other elements of the framework will be major inputs to ILRI priority setting and resource allocation (Figures 1.1, 1.2). The framework and guidelines for use will be provided to NARS and others to assist their livestock research priority setting/resource allocation decisions.

Annex III. ILRI partners

National institutions

Asia

Bhutan
>	Ministry of Agriculture

China
>	Chinese Academy of Agricultural Sciences
>	Yunan Beef Cattle and Pasture Research Institute

India
>	National Dairy Development Board

Indonesia
>	Balai Penelitian Ternak
>	Institute Pertanian Bogor

Malaysia
>	Department of Veterinary Services
>	University Putra Malaysia

Nepal
>	Lumle Agricultural Research Centre

Philippines
>	Bureau of Animal Industry, Department of Agriculture
>	Central Luzon State University
>	Department of Agriculture
>	Don Mariano Marcos Memorial State University
>	Philippine Council for Agriculture, Forestry and Natural Resources Research and
>	 Development
>	University of the Philippines at Los Baños

Thailand
>	Chulalongkorn University
>	Conservation and Use of Animal Genetic Resources in Asia and the Pacific
>	Kasetsart University
>	Khon Kaen University
>	Ministry of Agriculture and Cooperatives
>	Prince of Songkla University

Vietnam
>	Cantho University
>	Institute of Agricultural Sciences of South Vietnam
>	Ministry of Agriculture and Rural Development
>	National Institute of Animal Husbandry

Australia/New Zealand

Australia
>	Australian Centre for International Agricultural Research
>	Commonwealth Scientific and Industrial Research Organisation
>	La Trobe University

Molecular Animal Genome Centre
Queensland Department of Primary Industries
University of Adelaide
University of Queensland
University of Western Australia

New Zealand
Massey University
New Zealand Pastoral Agriculture Research Institute Ltd

Europe

Austria
University of Vienna

Belgium
Catholic University of Louvain
Ghent University
Institute of Tropical Medicine 'Prince Leopold'
Namur University
Université libre de Bruxelles
Université de Liège
Vrije Universiteit Brussel

France
Centre de coopération internationale en recherche agronomique pour le développement
Ecole nationale vétérinaire de Lyon
Institut de recherche pour le développement
Institut national pour la recherché agronomique
Université de Clermont-Ferrand
Université de Bordeaux
Université de Tours

Germany
Bernhard Nocht Institute for Tropical Medicine, Hamburg
Free University of Berlin
Georg-August Universitat
Institute for Genetics
Institute of Microbiology
Research Institute for the Biology of Farm Animals
University of Hohenheim

Ireland
Trinity College, Dublin

The Netherlands
ID-Leylestad
Organization for Agricultural Research
University of Utrecht
Wageningen Agricultural University
Wageningen Institute of Animal Sciences

Norway
Agricultural University of Norway

Sweden
        Swedish University of Agricultural Sciences

Switzerland
        Federal Institute of Technology, Zurich
        Swiss Federal Veterinary Office
        Swiss Tropical Institute

United Kingdom
        Centre for Tropical Veterinary Medicine, The University of Edinburgh
        Institute of Animal Health, Compton
        Institute of Zoology, London
        Livestock in Development
        Moredun Research Institute
        Natural Resources Institute
        Rowett Research Institute
        University of Cambridge
        University of Durham
        University of Glasgow
        University of Liverpool
        University of Newcastle
        University of Nottingham
        University of Manchester
        University of Oxford
        University of Reading
        University of Strathclyde
        University of Warwick

Japan
        University of Hokkaido
        National Institute for Animal Health, Tsukuba
        Obihiro University, Hokkaido
        Shirakawa Institute for Animal Genetics

Latin America
Bolivia
        Instituto Boliviano de Tecnologia Agropecuaria
        National Epidemiology and Disease Control Unit

Brazil
        Empresa Brasileira de Pesquisa Agropecuaria

Chile
        Institute for Agricultural Development
        Ministry of Agriculture
        University of Chile

Colombia
        Instituto Colombiana Agropecuario
        Universidad nacional
        University of Caldas

Costa Rica
        Escuela Centroamericana de Ganadería
        Ministerio de Agricultura y Ganadería

Universidad de Costa Rica

Ecuador

Instituto Nacional de Investigaciones Agropecuarias

Mexico

Universidad Autónoma de Yucatan

Nicaragua

Ministerio de Agricultura

Peru

Centro de Investigación en Recursos Naturales y Medio Ambiente
Consorcio para el Desarrollo Sostenible de la Ecoregion Andina
Consorcio para el Desarrollo Sostenible de Ucayali
Instituto Nacional de Investigaciones Agrícolas
Instituto Veterinario de Investigaciones Tropicales y de Altura
Ministry of Agriculture
National Agrarian University
University of Cajamarca
University of San Marcos

Uruguay

Ministry of Agriculture

Africa

Angola

Ministry of Agriculture and Rural Development

Benin

Institut national de recherche agricole du Bénin
Université nationale du Benin

Botswana

Department of Agricultural Research
Ministry of Agriculture
Ministry of Science, Technology and Vocational Training

Burkina Faso

Institut de l'environnement et de recherche agricole
Ministère des Ressources Animales
Université de Ouagadougou

Burundi

Institut des sciences agronomiques du Burundi

Cameroon

Animal Science and Veterinary Research Institute
Dschang University
Institut de recherche agonomique

Côte d'Ivoire

Anader
Centre ivorien de recherche économique et sociale

Centre national de recherche agronomique
Ministère de l'agriculture et des ressources animales

Ethiopia
Addis Ababa University
Alemaya University of Agriculture
Amhara National Regional Bureau of Agriculture
Ethiopian Agricultural Research Organisation
Ethiopian Health and Nutrition Research Institute
Ethiopian Science and Technology Commision
Mekelle University
Ministry of Agriculture
Oromiya Agricultural Development Bureau
Tigray Bureau of Agriculture

Eritrea
Ministry of Agriculture

Ghana
Agricultural Research Institute
Animal Research Institute
Ministry of Agriculture
Savanna Agricultural Research Institute
University of Ghana
University of Science and Technology

Kenya
Agricultural Research Foundation
Egerton University
Institute for Policy Analysis Research
Kenya Agricultural Research Institute
Kenya Trypanosomiasis Research Institute
Kenyatta University
Kenya Wildlife Service
University of Nairobi
Veterinary Department

Lesotho
Ministry of Agriculture and livestock

Madagascar
Ministère de la recherche scientifique et technologique pour le developpement
Université d'Antananarivo

Malawi
University of Malawi, Bunda College of Agriculture

Mali
Institut d'économie rurale
Laboratoire vétérinaire central
Institut du Sahel
Ministère de l'agriculture
Office malien du bétail et de la viande

Mauritius

Ministry of Agriculture

Morocco
Institut agronomique et vétérinaire Hassan II

Mozambique
National Institute of Veterinary Research
Instituto de Produccão Animal
University of Maputo

Namibia
Ministry of Agriculture, Water and Rural Development

Niger
Institut national de recherches agronomiques du Niger
Ministére des ressources animales
Université Abdou Moumouni de Niamey

Nigeria
Ahmadu Bello University
Federal Ministry of Agriculture and Natural Resources
National Animal Production Research Institute
National Root Crops Research Institute
Rivers State University of Science and Technology
University of Agriculture, Abeokuta

Central African Republic
Institut centrafricain de la recherche agronomique

Democratic Republic of Congo
Bureau central de la trypanosomiase
Centre de recherche en énergie nucléaire
Institut national d'étude et de recherche agronomique
Laboratoire vétérinaire de Kinshasa
Université de Kinshasa

Rwanda
Institut des sciences agronomiques du Rwanda

Senegal
Université Cheik Anta Diop
Institut sénégalais de recherches agricoles

Sierra Leone
Njala University College

South Africa
Department of Agriculture
Irene Animal Production Institute
Onderstepoort Veterinary Institute
University of Pretoria

Sudan
Animal Resource Research Corporation
Ministry of Agriculture, Natural and Animal Resources

Swaziland
>Ministry of Agriculture

Tanzania
>Livestock Production Research Institute
>Ministry of Agriculture and Co-operatives
>Selian Agricultural Research Institute
>Sokoine University of Agriculture
>Veterinary Department

Togo
>Direction scientifique de la recherche agronomique
>Université du Bénin

Tunisia
>Institut national agronomique de Tunisie

Uganda
>Co-ordination Office for Control of Trypanosomiasis
>Makerere University
>National Agricultural Research Organisation

Zambia
>Department of Veterinary and Tsetse Control Services
>Ministry of Agriculture, Food and Fisheries
>Ministry of Science, Technology and Vocational Training
>University of Zambia

Zimbabwe
>Central Veterinary Laboratory
>Department of Research and Specialist Services
>University of Zimbabwe

Middle East
Israel
>Hebrew University
>University of Haifa

North America
Canada
>University of Guelph
>University of Manitoba
>University of Victoria

United States of America
>Colorado State University
>Cornell University
>Medical College of Ohio
>Michigan State University
>National Centre for Geographic Information and Analysis
>Pennsylvania State University
>Purdue University
>Texas A&M University
>The Institute for Genomic Research
>United States Department of Agriculture – Agricultural Research Service

University of California Davis
University of Florida
University of Georgia
University of Hawaii
University of Illinois
University of Massachusetts at Amherst
University of Missouri
University of Texas
University of Vermont
University of Wisconsin–Madison
Utah State University
Washington State University

Regional organisations

Asia and Pacific Association of Agricultural Research Institutes
Association for Strengthening Agricultural Research in Eastern and Central Africa
Centre international de recherche–développement sur l'élevage en zone subhumide
Centro Agronomico Tropical de Investigación y Enseñanza
Comité permanent inter-Etats de lutte contre la sécheresse dans le Sahel
Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricole
International Trypanotolerance Centre
Organization of African Unity/Inter-African Bureau of Animal Resources
Regional Centre for Graduate Study and Research and Agriculture in South East Asia
SADC Plant Genetic Resources Centre
Southern African Centre for Co-operation in Agricultural Research and Training

International organisations

Centre for Agriculture and Biosciences International
Food and Agriculture Organization of the United Nations
International Atomic Energy Agency
International Centre for Integrated Mountain Development
International Centre of Insect Physiology and Ecology
International Consortium for Agricultural Systems Applications
Office internationale des épizooties
World Bank
World Health Organization

CGIAR centres

CIAT
CIMMYT
CIP
ICARDA
ICRAF
ICRISAT
IFPRI
IITA
IPGRI
IRRI
ISNAR
WARDA

Private sector

Brentec Laboratories, Kenya
Compagnie J. Van Lancker, Kinshasa, R. D. Congo

Coopers
Melinkrot, Zimbabwe
Merial

NGOs

African Conservation Centre
African Wildlife Foundation
Corpoica (Corporación Colombiana de Investigación Agropecuaria, Colombia)
Sasakawa Global 2000
Heifer Project International
World Vision
World Wide Fund for Nature

Annex IV. List of acronyms

ACC	African Conservation Centre, Kenya
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ADRI	Animal Disease Research Institute, Tanzania
AfDB	African Development Bank
AgResearch	New Zealand Pastoral Agriculture Research Institute Ltd
AHRC	Animal Health Research Centre, Uganda
AnGR	Animal genetic resources
ARC	Agricultural Research Council
ARI	Advanced Research Institute
ARI	Agricultural Research Institute, Ghana
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AWF	African Wildlife Foundation, Tanzania
BNITM	Bernhard Nocht Institute for Tropical Medicine, Hamburg
CABI	Center for Agriculture and Biosciences International
CAC	Central Asia and the Caucasus
CBPP	Contagious bovine pleuropneumonia
CFC	Common Fund for Commodities
CCER	Centre commissioned external review
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)
CILSS	Comité permanent inter-Etats de lutte contre la sécheresse dans le Sahel
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Center)
CIP	Centro Internacional de la Papa (International Potato Center)
CIRAD-EMVT	Centre de coopération internationale en recherche agronomique pour le développement-Département d'élevage et de médecine vétérinaire tropicale
CIRDES	Centre international de recherche-développement sur l'élevage en zone subhumide
CIRES	Centre ivorien de recherche économique et sociale
COCTU	Coordinating Office for Control of Trypanosomiasis in Uganda
CONDESAN	Consortium for the Sustainable Development of the Andean Ecoregion
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricole
CRSP	Collaborative Research Support Program
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia
CSU	Colorado State University
CVL	Central Veterinary Laboratory, Zimbabwe
CVLM	Central Veterinary Laboratory, Mali
DLD	Department for Livestock Development, Thailand
DMP	Desert Margin Programme
DNA	Deoxyribonucleic acid
EARO	Ethiopian Agricultural Research Organization
ECF	East Coast fever
ELISA	Enzyme-linked immunosorbent assay
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
EPHTA	Ecoregional Programme for the Humid and Subhumid Tropics of SSA
EPMR	External Programme and Management Review
EU	European Union
FAO	Food and Agriculture Organization of the United Nations

FARA	Forum for Agricultural Research in Africa
GDP	Gross domestic product
GEF	Global Environment Facility
GIS	Geographic information systems
GTZ	German Agency for Technical Co-operation
IADB	Inter-American Development Bank
IAEA	International Atomic Energy Agency
IARC	International agricultural research centre
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICASA	International Consortium for Agricultural Systems Applications
ICIMOD	International Centre for Integrated Mountain Development
ICIPE	International Centre of Insect Physiology and Ecology
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ID-DLO	Institute for Animal Science and Health, Organization for Agricultural Research, The Netherlands
ID-Lelystad	Organization for Agricultural Research, Lelystad
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
INTG	IARC/NARS Training Group
IPAR	Institute for Policy Analysis Research, Nairobi
IPB	Institute Pertanian Bogor, Indonesia
IPGRI	International Plant Genetic Resources Institute
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
ITC	International Trypanotolerance Centre
ITM	Institute of Tropical Medicine, Belgium
IVC	Inland Valley Consortium
KARI	Kenya Agricultural Research Institute
KETRI	Kenya Trypanosomiasis Research Institute
KSh	Kenya shillings
KWS	Kenya Wildlife Service
LAC	Latin America and the Caribbean
L&E	Livestock and environment
LEI	Agricultural Economics Research Institute, Netherlands
MAG	Ministerio de Agricultura y Ganadería, Costa Rica
MoA	Ministry of Agriculture
MSU	Michigan State University
MTP	Medium-term plan
NARES	National agricultural research and extension systems
NARO	National Agricultural Research Organization, Uganda
NARS	National agricultural research systems
NCGIA	National Center for Geographical Information and Analysis
NGO	Non-governmental organisation
NIA	National Institute for Animal Health, Tsukuba
NRI	Natural Resources Institute, UK
OAU/IBAR	Organization of African Unity/Inter-African Bureau of Animal Resources
OIE	Office internationale des épizooties
OMBV	Office malien du bétail et de la viande
OPEC	Organization of Petroleum Exporting Countries
PCR	Polymerase chain reaction

PRA	Participatory rural appraisal
QDPI	Queensland Department of Primary Industry
QTL	Quantitative trait loci
R&D	Research and development
RIBFA	Rostock Institutue for Biology of Farm Animals
SACCAR	Southern African Center for Co-operation in Agricultural Research and Training, Botswana
SADC	Southern African Development Community
SEARCA	Regional Centre for Graduate Study and Research and Agriculture in South East Asia
SLP	System-wide Livestock Programme
SPAAR	Special Program for African Agricultural Research
SPLR	Strengthening Partnerships for Livestock Research
SSA	Sub-Saharan Africa
SSY	Senior staff years
S&T	Ethiopian Science and Technology Commission
SUA	Sokoine University of Agriculture
TAC	Technical Advisory Committee of the CGIAR
TAMU	Texas A&M University
TBD	Tick-borne diseases
UC Davis	University of California-Davis
UK	United Kingdom
USA	United States of America
USAID	United States Agency for International Development
USDA-ARS	United States Department of Agriculture-Agricultural Research Service
UST	University of Science and Technology, Ghana
WANA	West Asia and North Africa
WARDA	West Africa Rice Development Association
WHO	World Health Organization
WSU	Washington State University, USA
WWF	World Wide Fund for Nature
WWW	World wide web
ZNP	Zimbabwe National Parks